IRON & COAL

THE IRON AND COAL TRADES' REVIEW

VOL. 182
No. 4,841

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LONDON: FRIDAY, APRIL 28, 1961

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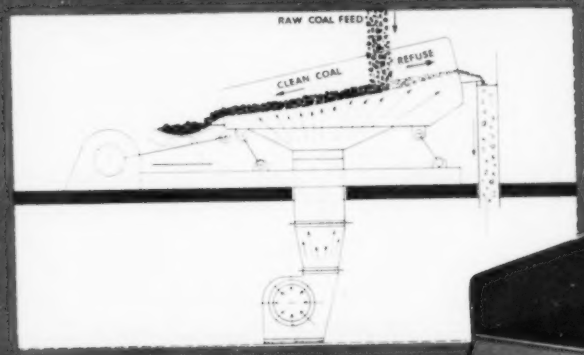

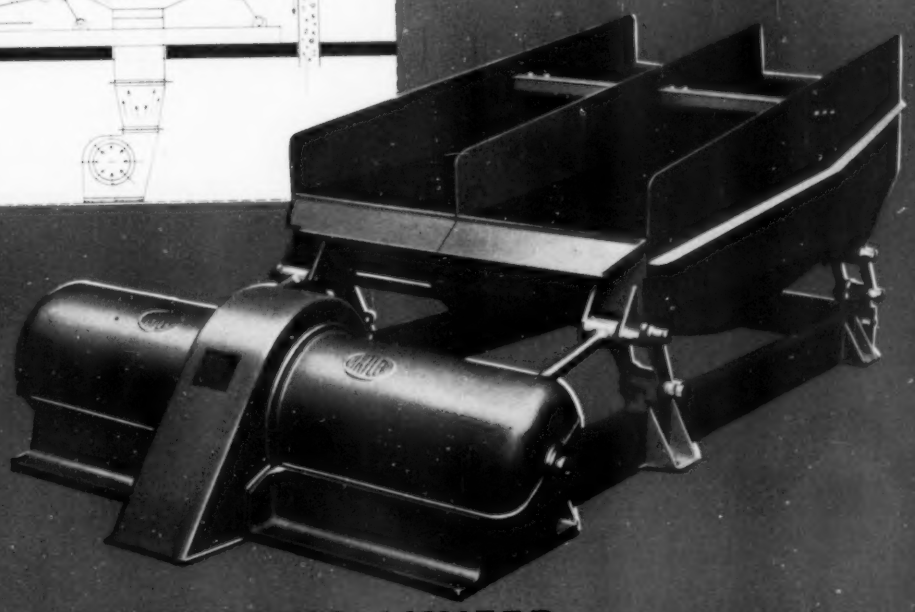

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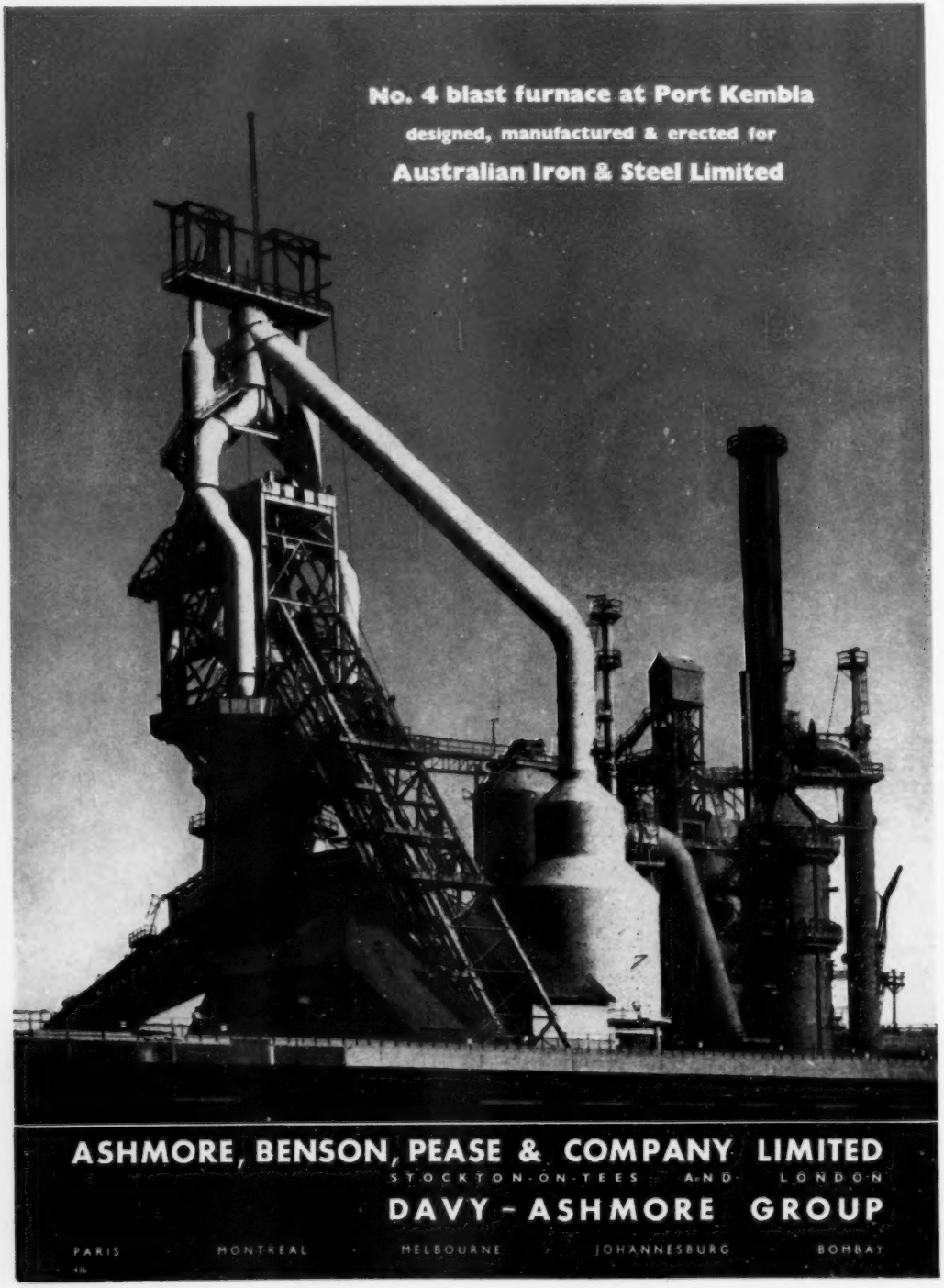
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designed, manufactured & erected for
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by SUMMERSON'S

This sidings contract for the North West Gas Board, Mersey Group, had to be laid without disturbing existing gas production. As Consulting Engineers working with the Gas Board engineers, Summerson's surveyed and designed the layout and drew up a specification. As main contractors, Summerson's manufactured and installed the track which consisted of two different designs. One, involved 8,100 yards of track which included 41 turnouts, 12 tandem turnouts and 3 single cross overs, the other consisted of 765 yards of fully guarded track for fixing in concrete to top rail level, including a scissors cross over and turnouts. The main coke sidings have electro-pneumatically operated switches to direct wagons which move from the tippler tables by gravity, into the correct road. Just another example of how Summerson's experienced "know how" enables a difficult installation to be successfully carried out.

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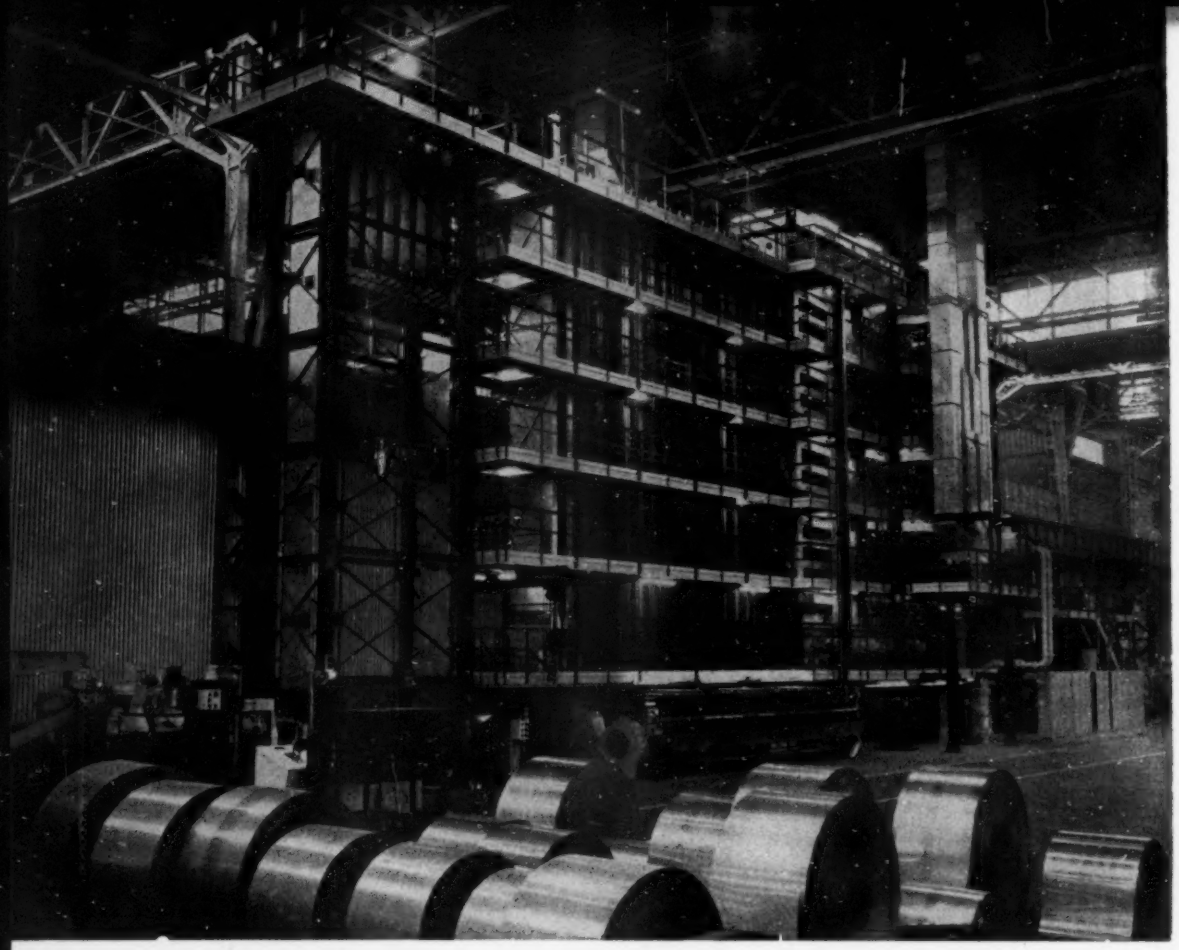

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backed with

Fosalsil Economite Insulating Bricks

form the lining of the continuous vertical tinplate strip annealing line installed by The Incandescent Heat Co. Ltd. at the Velindre Works of The Steel Company of Wales Ltd. The normal operating speed of the plant is 600 ft. per minute, and the output is 2,500 tons per week, based on 30 inch wide strip ·011 gauge, although the maximum strip width is 38 inch.

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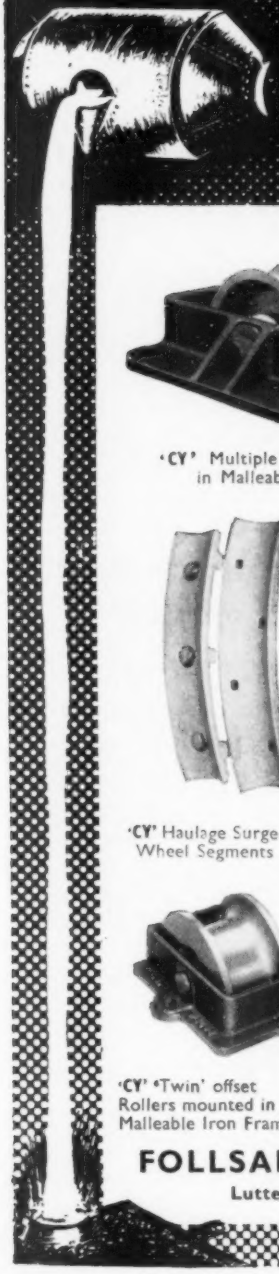

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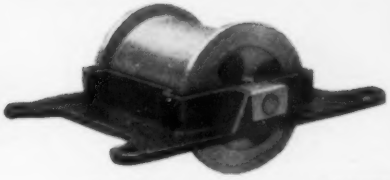

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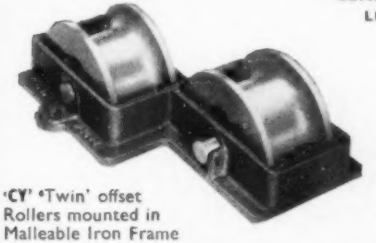

'CY' 'Twin' offset Rollers mounted in Malleable Iron Frame

'CY' Angle Rollers mounted in Malleable Iron Frame

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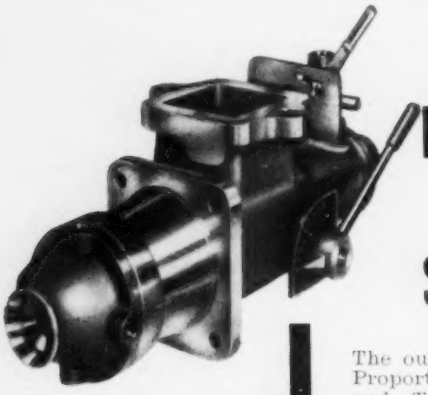

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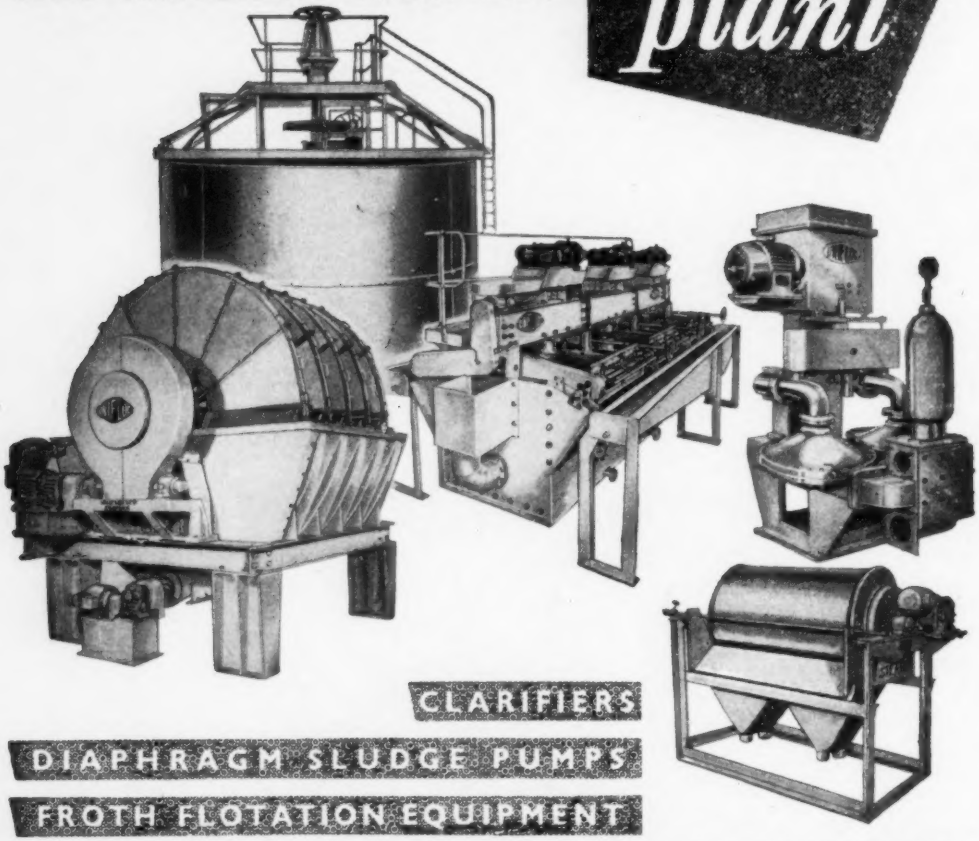

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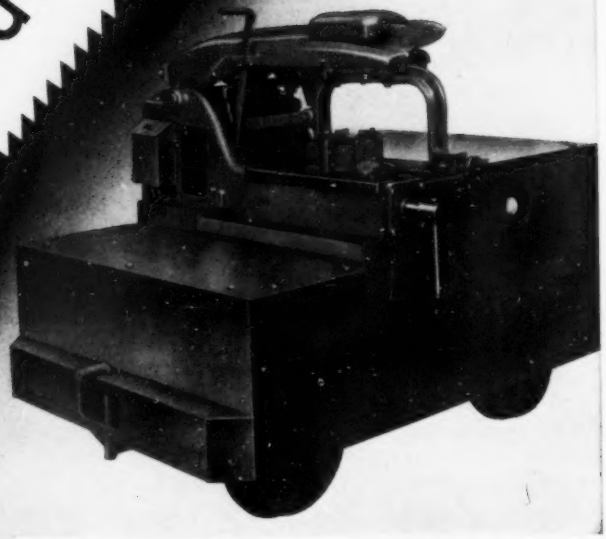

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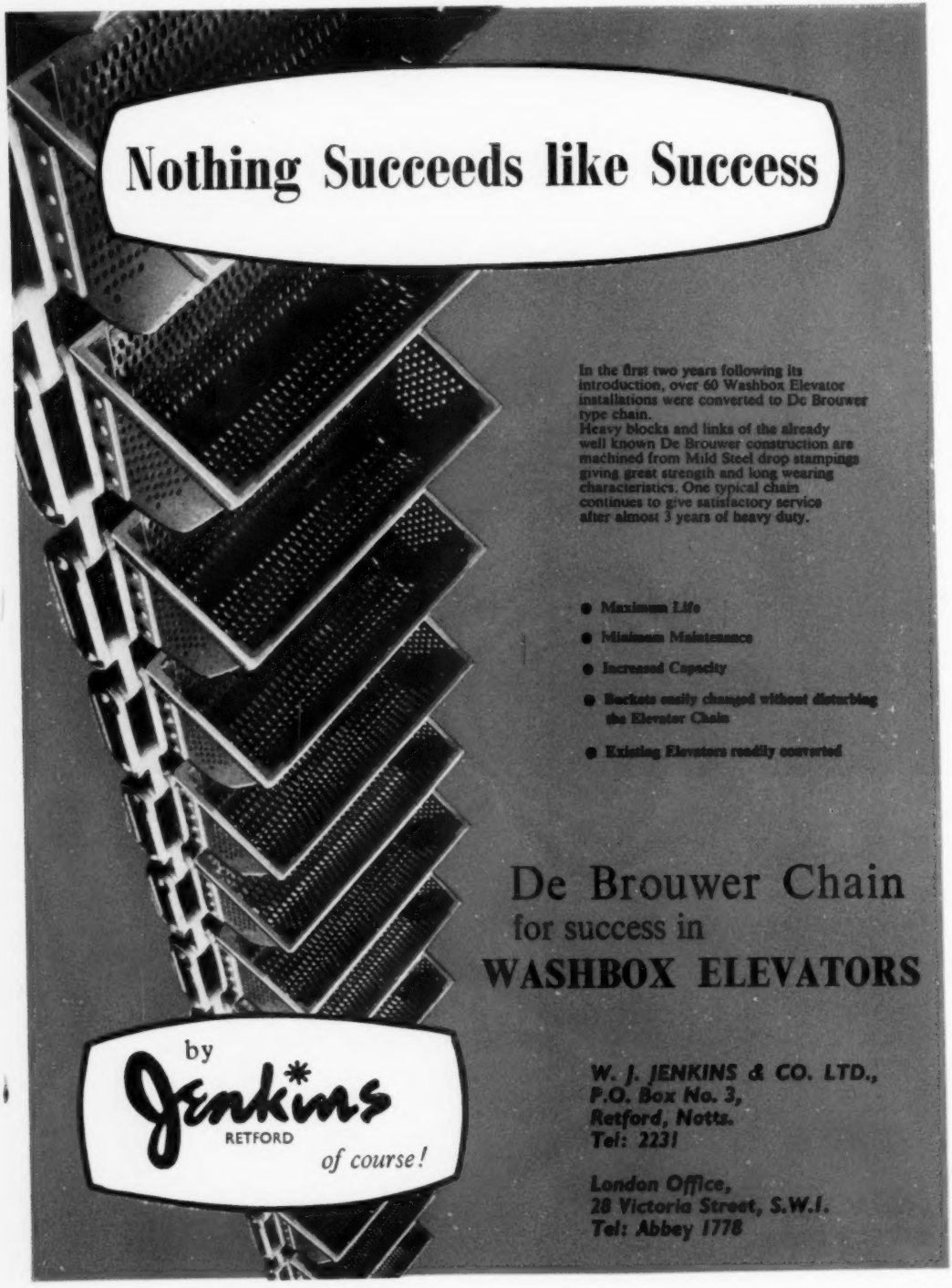

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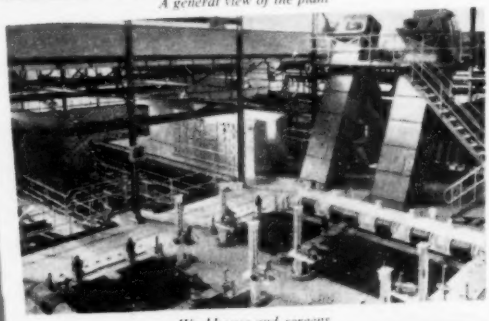
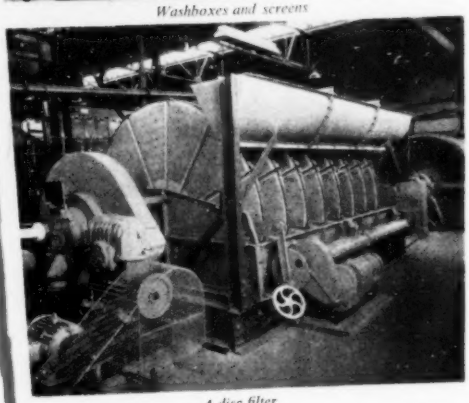
THESE NEW PLANTS mean

A general view of the plant



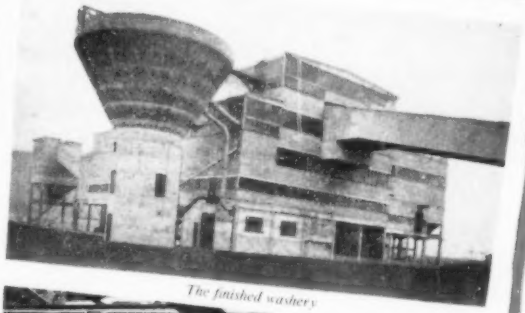
Washboxes and screens



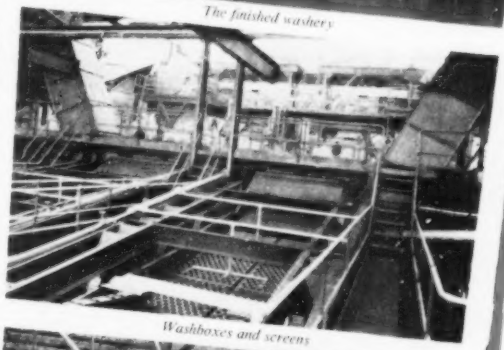
A disc filter

1 Three views of the washery at Killoch Colliery in the Scottish Division of the National Coal Board. This Baum plant will clean 500 tons of coal per hour.

They mean business as far as the coal industry is concerned because the efficient cleaning and handling of coal is vital to the industry's future. They mean business for us too, business to which we can apply our long-acquired mastery of the art of coal preparation. Here, three of the nine plants we are building or commissioning at British collieries are illustrated. They are typical examples of coal preparation plants designed to serve the modern mine.



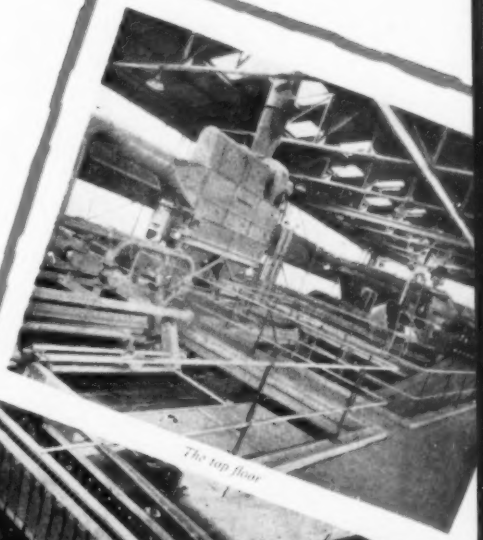
The finished washery



Washboxes and screens

Screens and filters

2 The Baum plant at Bowhill Colliery, also in the National Coal Board's Scottish Division. The capacity is 400 tons of coal per hour.



The top floor

The Drewboy separator

3 Pictures taken at Thorne Colliery in the North Eastern Division of the National Coal Board. This plant incorporates the highly successful Drewboy dense medium system.

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business

COMPLETE COAL PREPARATION PLANTS BY

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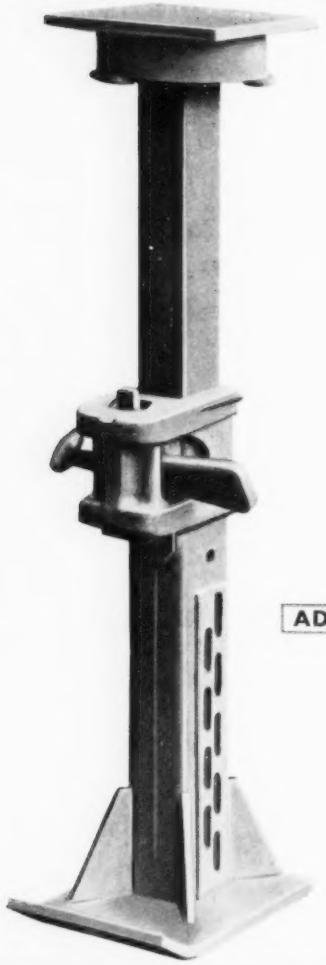

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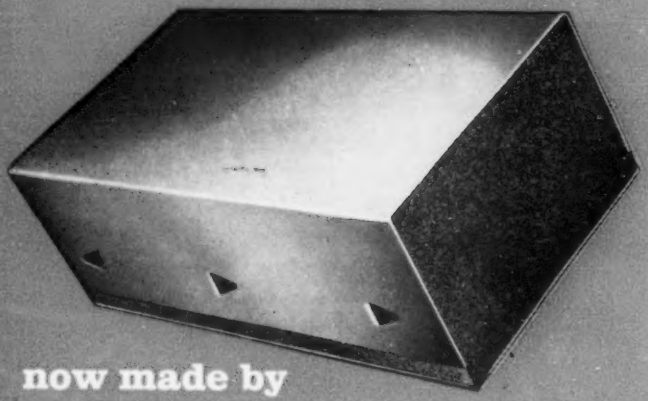

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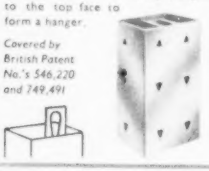
Covered by British Patent No.'s 546,220 and 749,491



FERROCLIP SUSPENSION

This method allows the brick to be suspended from the end. The Ferroclip hanger slot may be moulded into any roof or wall shape.

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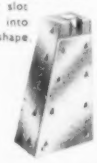

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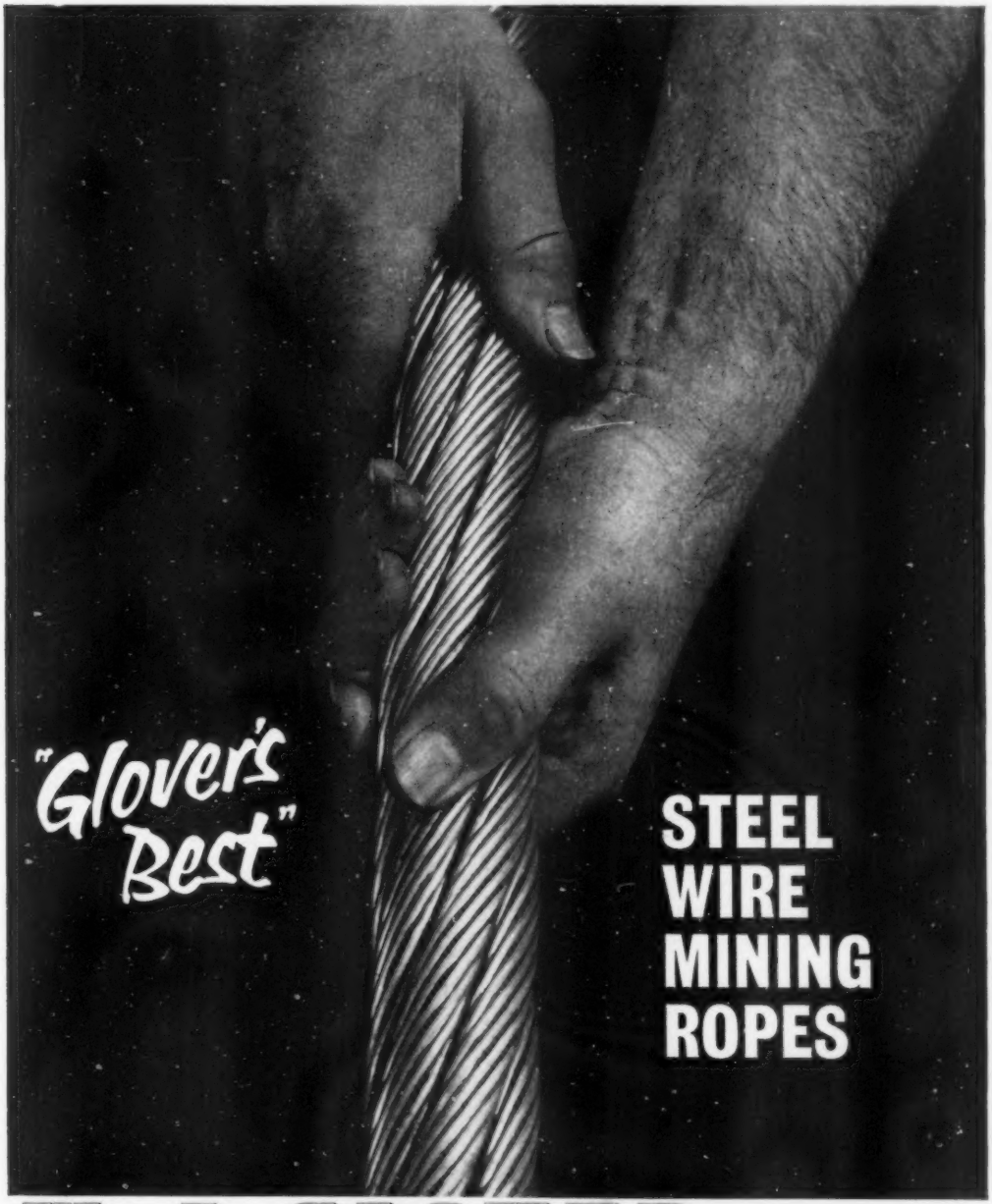

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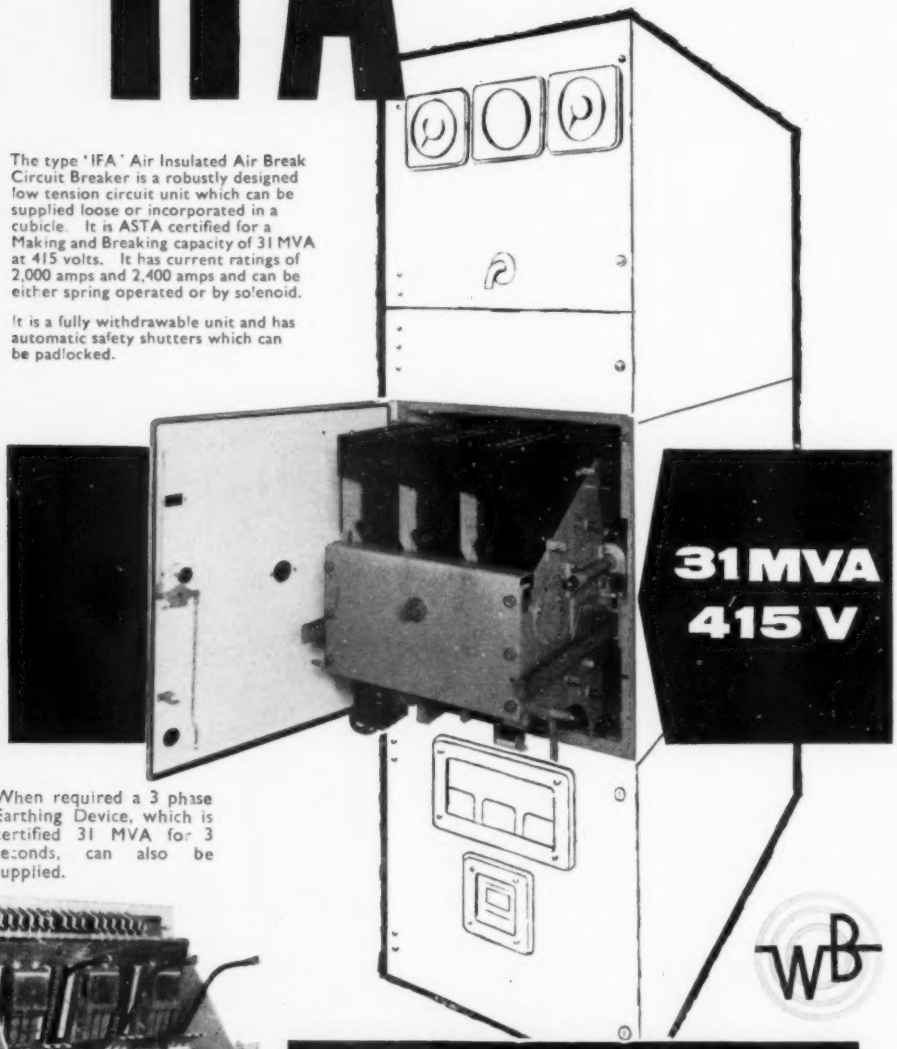
It is a fully withdrawable unit and has automatic safety shutters which can be padlocked.



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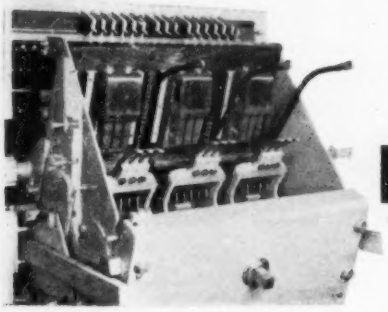

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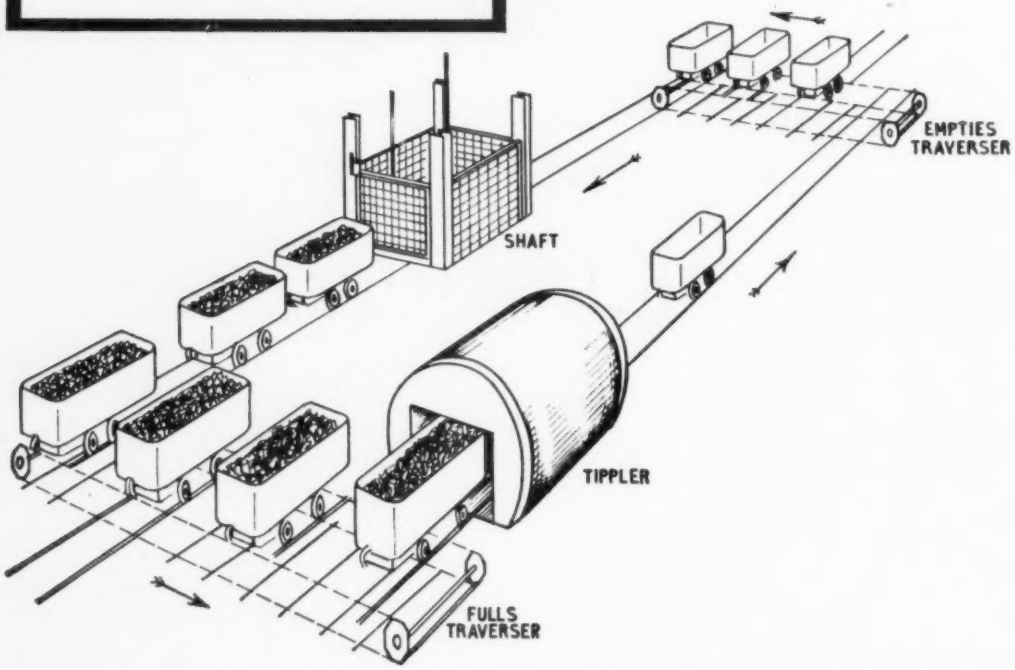

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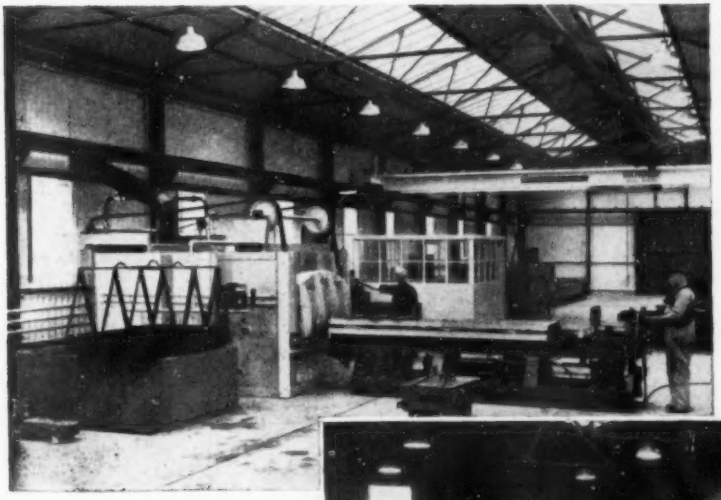

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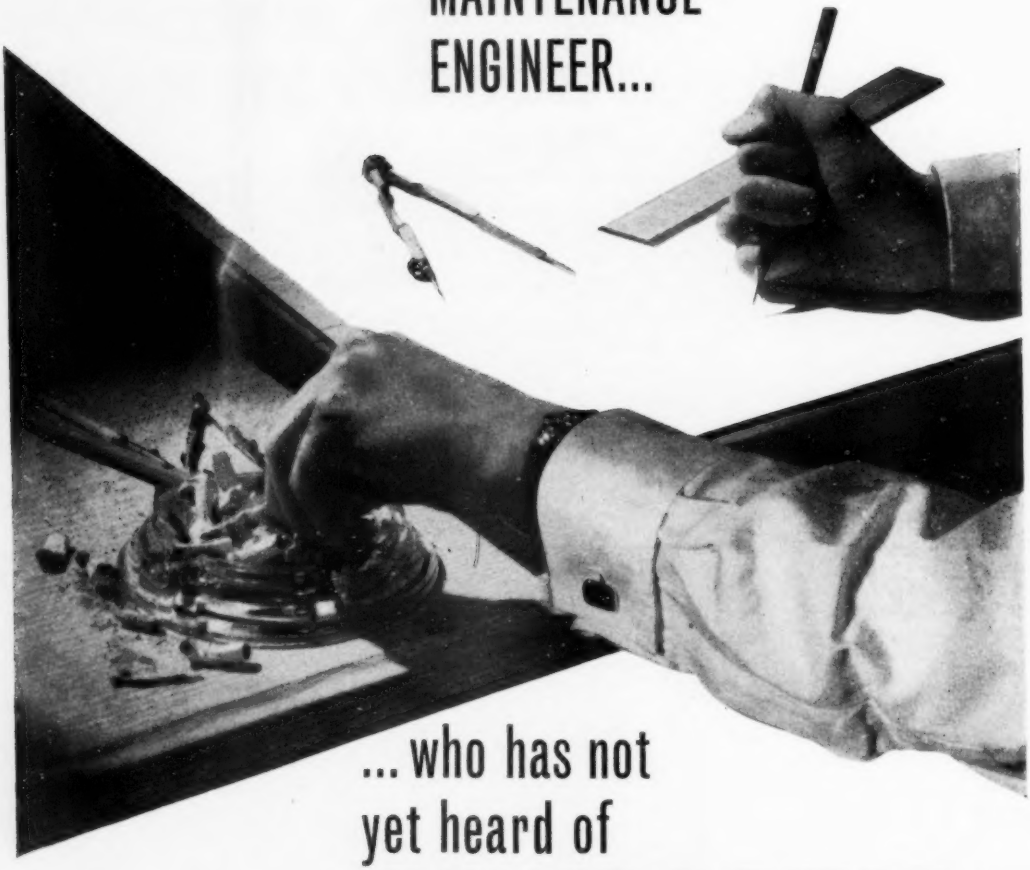

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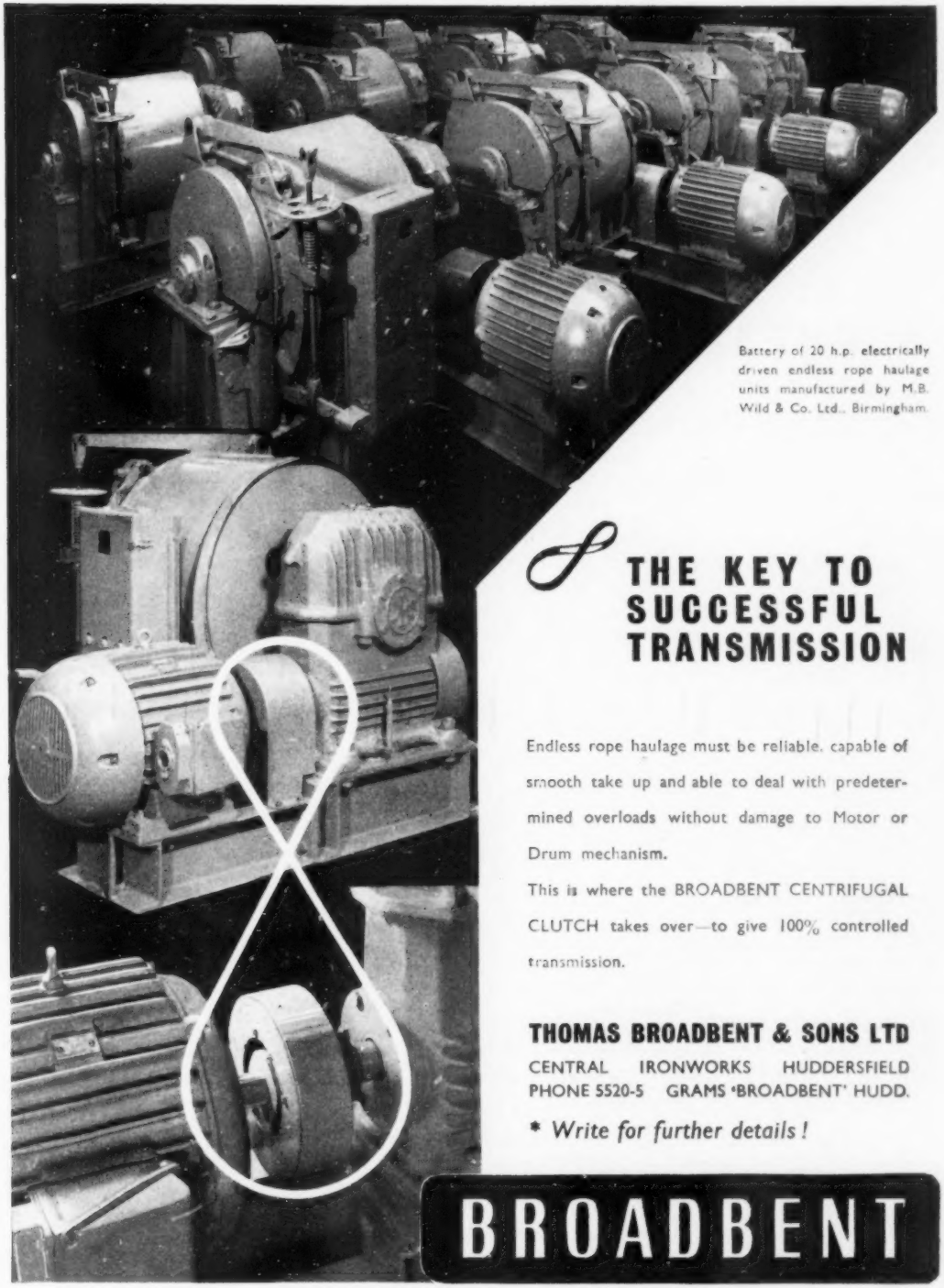

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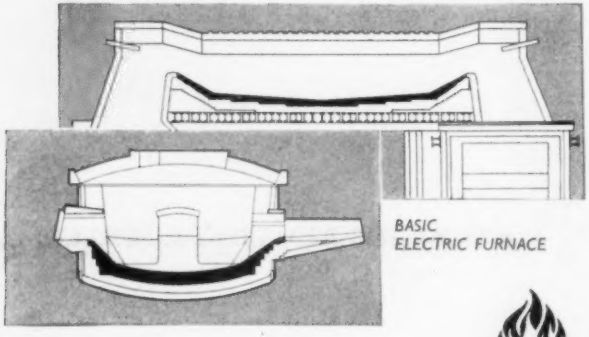

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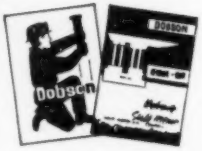

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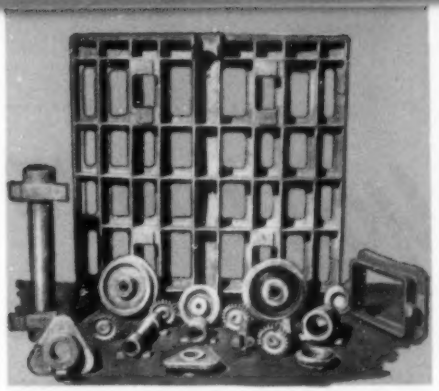

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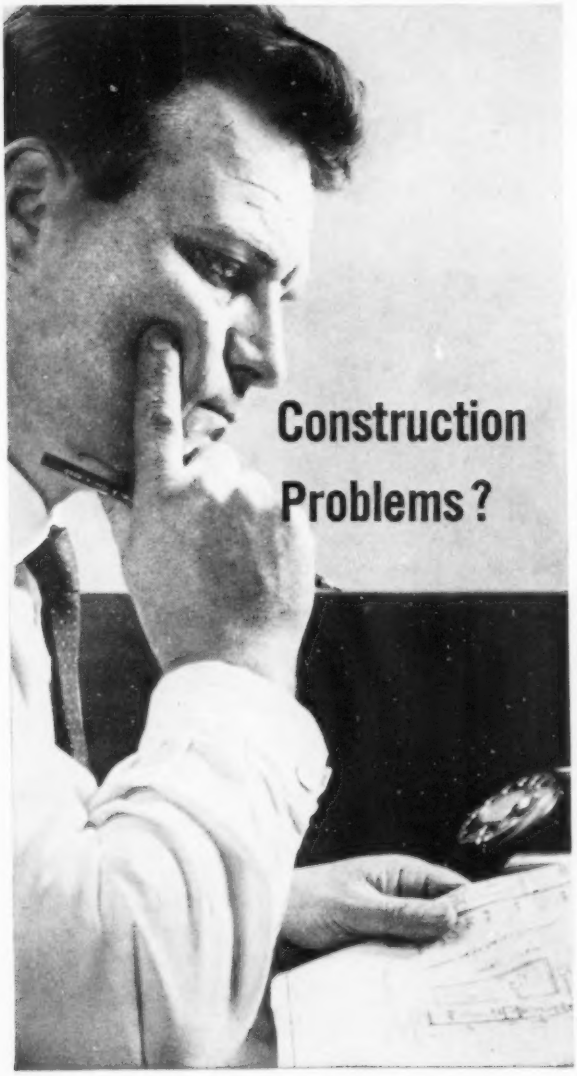

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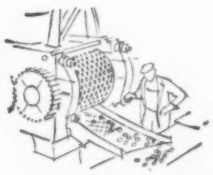

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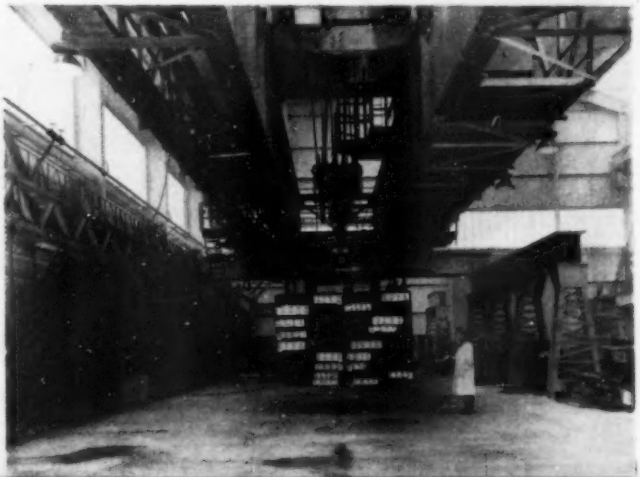

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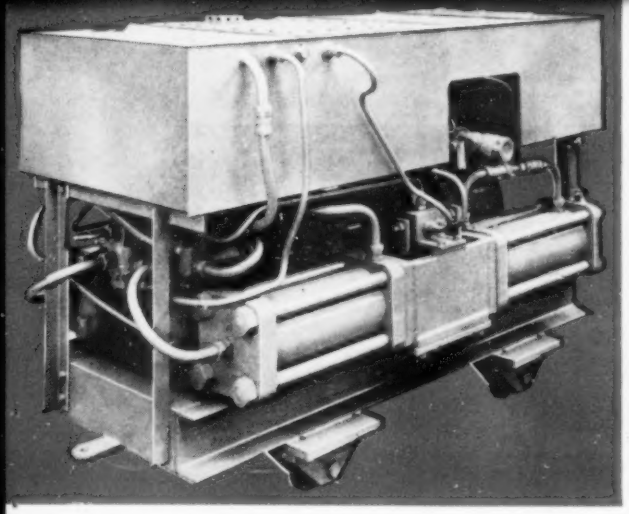

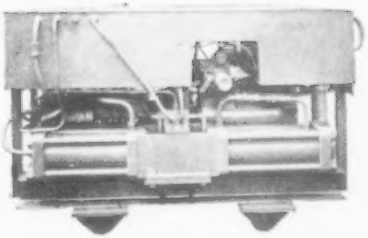

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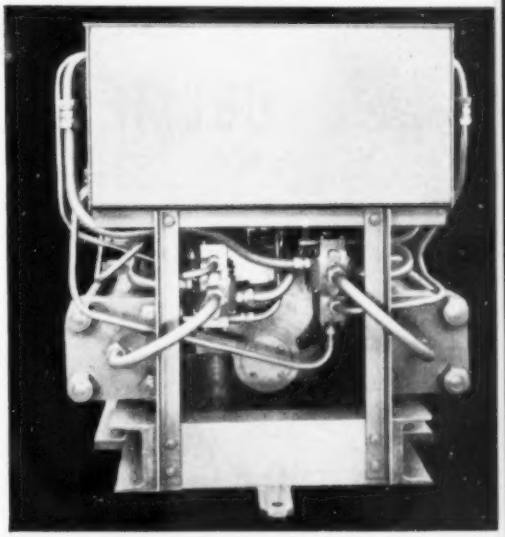

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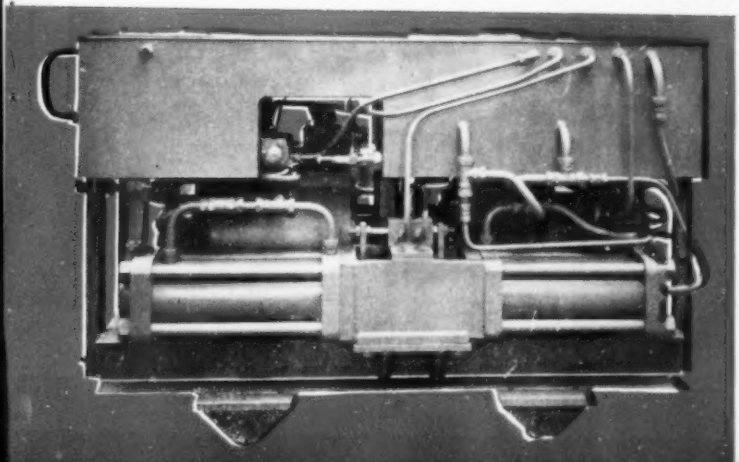

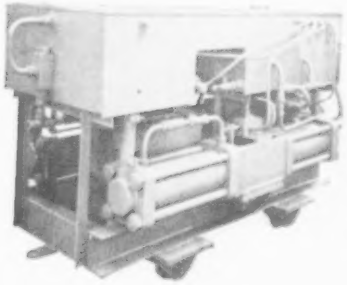

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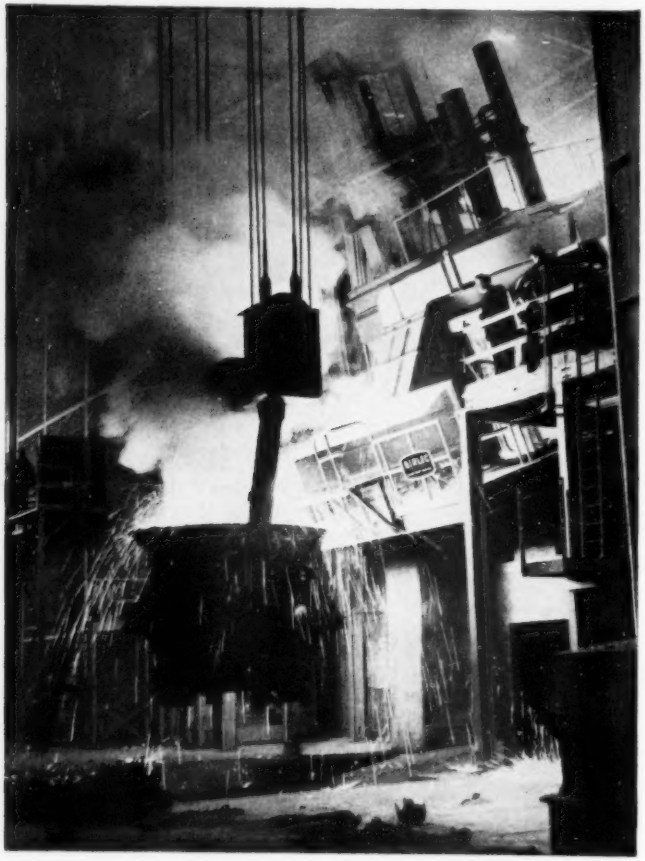

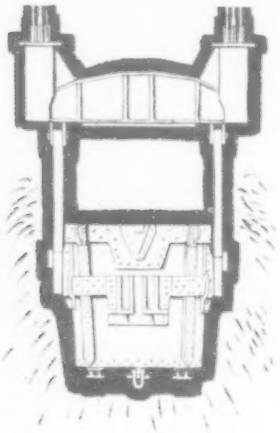

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Vol. 182
No. 4841

IRON & COAL
THE IRON AND COAL TRADES' REVIEW

APRIL 28
1961

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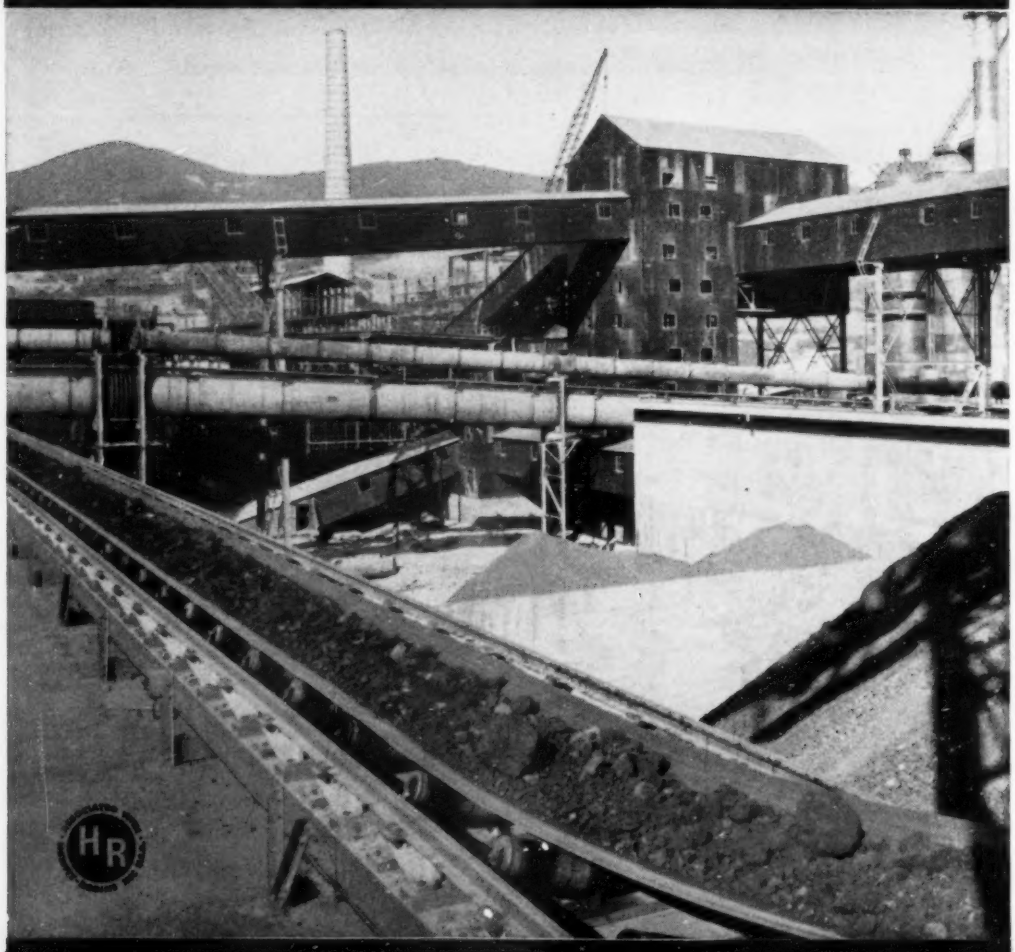
Mine to mill, ship to shore, start to finish



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IRON & COAL
THE IRON AND COAL TRADES REVIEW

Vol. 182 April 28, 1961 No. 4,841

Steel—Today and Tomorrow

"BECAUSE an excessive volume of capital expenditure would be wasteful of the country's resources as well as injurious to the industry's efficiency and economy, the board's examination of schemes has to be critical as well as constructive. This examination will now need to give increasing attention to the contribution schemes can make to furthering the efficiency of the industry and less to the contribution they may make to expanding supplies." This quotation comes from the summary of the White Paper, "Development in the Iron and Steel Industry," prepared by the Iron and Steel Board and it would be difficult to express more concisely and accurately, not only the general purport of the White Paper but the spirit which motivates it throughout.

It presents in very few words the unique paternalism of the board in its guidance and control of one of the greatest and most important industries in the country. In it there is expressed not only the board's primary concern for the present and future welfare of the iron and steel industry, but its awareness of its place in the national economy. Whatever interpretation is placed on the report it is a remarkably fine piece of work—careful in its analysis, studied in its findings, obviously prepared with great skill and judgment and yet, even to the layman, eminently readable. Indeed, there is no necessity to read further than the second of its 395 paragraphs to learn that, because the report must necessarily include various technical terms the meaning of which may not be clear to those unfamiliar with iron and steel technology, an outline of the chain of steelmaking operations from raw materials to finished product and a glossary of some of these technical terms has been included in Appendix V.

In some quarters the report is certain to be referred to as the industry's, or at any rate the Iron and Steel Board's third Five-Year Plan. It is nothing of the kind. Under an administration familiar in many countries in the post-war world but alien to Britain, such a report could be the basis of a Plan, but it is as misleading to refer to this as a Five-Year Plan as it would be to refer to Sir Cyril Musgrave, chairman of the board, as British Commissar for Iron and Steel. It is, as he remarked, "a very serious, conscientious, and painstaking attempt to assess the future requirements in detail up to 1965 of all types of steel products" and the operative word is "assess."

The report reviews the growth of UK and world steel production and the evolution of demand from 1957 to 1960 before making a careful and soundly balanced estimate of future demand and the capacity required to meet it—not only of raw steel, but of finished and semi-finished products, scrap and pig-iron, and iron ore. It goes on to deal, equally conservatively, with the future, so far as the board sees it, of ore shipping and port requirements, the part that fuel will play in the vast complex of the steel industry, and such closely related matters as iron and steel foundries, location of plant, labour and productivity, inland transport, steelworks plant, financial aspects of development, and technical progress.

Much as an architect's perspective gives his idea of what the finished building will look like in surroundings that he visualizes might accompany the development of the area and which do not necessarily apply here and now, so does the report survey and put into perspective the steel industry as it might well be in 1965. No one could be expected to build with any degree of ultimate success and lasting quality from an architect's perspective; no Government will regard this report as a Five-Year Plan setting out definite targets or aims which must be achieved, come what may.

To quote Sir Cyril Musgrave once again. He said: "The board and its staff are not supermen and cannot do more than estimate what future requirements are likely to be and to form judgments after consultation with everybody concerned. I hope you won't think we have been reckless, but hope you will think we have been courageous."

Possessing no crystal ball, the board is perhaps courageous to state categorically that, generally, there is for the first time for many years the prospect that capacity in every section of the industry will be sufficient to meet the probable demand and this from modern and efficient plant or from older plants which are competitive with such modern plant. The passing of years—or even months—can put a completely different perspective upon such a statement, particularly if it is quoted out of context. But the tenor of the report is such that it is obvious that the board has not made this and similar statements without full and well-substantiated information. It has frequent and detailed consultation and discussions with iron and steel producers, the industry's representative organizations, with consumers, plant manufacturers, suppliers of the industry's services and raw

materials, and Government departments in this country. It keeps a close watch on trends in the production and consumption of steel oversea, both by individual contacts and participation in the work of international organizations concerned with iron and steel. Such information is supplemented by up-to-date estimates from all iron and steel producers (except iron and steel founders) of productive capacity and of the related raw material and labour requirements in the years ahead, and an indication of plans for as much as 10 years ahead.

The consequent assessment of not only the national but the international demand and supply position leads the board to the general conclusion that the period during which the major consideration has been to expand capacity is giving way to a period when the improvement of efficiency will be the principal objective of the industry. Competition among producers can be expected from time to time to lead to development proposals from more firms than may be justified, and it is, therefore, that the board visualizes that its examination of such schemes in the future, to be critically constructive, will come down more heavily on the side of the furthering of efficiency in the industry rather than on the side of expanding supplies, so familiar in the post war years.

The estimate for the years beyond 1965 is cautious, but still optimistic. Admitting that an estimate for 1970 must be highly speculative, the board believes that a crude steel capacity of the order of 35,000,000 tons may then be required and, in favourable circumstances, this requirement could be at least 1,000,000 tons greater. A continuing increasing emphasis may also be expected on such lighter products as sheet and strip, particularly in alloy and stainless qualities, tinplate for canning, ferro-concrete bars, and light sections.

The contribution that some of the new processes and techniques will make to capacity and efficiency is highly problematical. There may well be an enormous potential in plant already existing or under construction, but the board feels it reasonably certain that in the period beyond 1965 substantial increases will be possible in almost all sections of the industry for relatively modest capital expenditure.

MP Suggests a Training Levy on Industry

THERE was urgent need to supplement the work of the Industrial Training Council by local training schemes, said Mr. Robert Carr, MP, chairman of the committee on industrial training, at the annual conference of the Association of Youth Officers at B'rmingham, last weekend.

He contended that there was a strong case for making the whole of industry contribute in cash, if not in kind, by imposing a training levy on all companies, with remission according to the amount of training which each firm was doing.

Passing Thoughts . . .

IT is no use pretending that it is not difficult for me to talk about fuel without becoming heated; indeed, I think I might be forgiven if I burst into flames after the Budget announcement that our principal steelmaking fuel is to cost us more and that industry may have to face a payroll tax as well as an increase in profits tax.—SIR JULIAN PODE, managing director of the Steel Company of Wales, Limited, speaking at the annual luncheon of the Institute of Fuel.

> *The merit of a payroll tax, properly devised, lies in the fact that it should be in substitution for existing taxation. What was needed was a stimulus, so that by increased efficiency employers could have earned tax remissions, in turn, enabling them to reduce prices. . . . Instead, the surcharge if applied would fall on both good and bad . . . on companies making profits and those making losses. It would certainly increase costs.—British Employers' Confederation.*

At a time when industry and commerce are being urged to increase the number of apprentices in training, the threat of an employee tax may deter this desirable expansion, particularly among the small and medium sized firms. It might also discourage the larger sized firms, many of which are already training home and overseas men to the fullest extent of their capacity, from maintaining their high load of apprentices and trainees.—MR. R. F. MARSHALL, central education manager, Associated Electrical Industries, Limited, in a letter to The Guardian.

> *I am not advocating feather-bedding, nor expecting high profits, but in an industrial community the protection of the so-called consumer can be carried to such lengths that great damage is done to the producer himself, and to industry. . . . It would be ironical to find the consumer so highly protected that the industry in which he is employed gets on the rocks.—LORD CHANDOS, chairman of Associated Electrical Industries, Limited.*

To act on the broad principle of serving first in any future period of shortage those who had remained loyal to coal is right and reasonable. But, of course, some who defensibly went over to oil for higher efficiency are producers of key manufactures and could not, without serious national consequences, be required to wait at the end of a coal queue.—Journal, Newcastle-upon-Tyne.

> *Even if we have a recovery this summer, we are still going to have serious problems in some of our coalfields where the demand has lessened and where the new machinery has produced extraordinary productive feats with very few people working.—PRESIDENT KENNEDY in a television interview.*

Admittedly the [Coal] Board was brought to its senses when supply outstripped demand, but now that it has gained maturity, let us not denounce it for showing some fight, for surely this is in the public interest.—Letter in the Scotsman.

Mr. M. H. LLOYD-HARRIES, who joined the company in 1945, has retired from the position of chief accountant and assistant secretary of the Whitehead Iron & Steel Company, Limited, Newport (Mon.)

Focus on Steel

POTENTIALITIES OF THE INDUSTRY IN 1965

"A VERY serious, conscientious, and painstaking attempt to assess the future requirements in detail up to 1965 of all types of steel products." This summary was given by Sir Cyril Musgrave, chairman of the Iron and Steel Board, at a Press conference in London on Monday, when he reviewed the principal features of the board's third special report "Development in the Iron and Steel Industry," which was published on Tuesday. The first report, published in 1955, dealt with the period 1953 to 1958 and the second, published in 1957, dealt with the period up to 1962.

Summing up, the chairman said that the salient points or morals to be drawn from the report seemed to be:—For the first time since before the war there was a prospect of there being adequate capacity in every section of steelmaking for every form of steel product with a reasonable margin to spare.

SIR CYRIL MUSGRAVE

It should be in existence by no later than the end of next year and a year or two after that capacity would be wholly modern and efficient. By the end of 1962 there would be adequate capacity to meet all requirements, including reasonable expectation of exports. As this was the first time such a situation had arisen since before the war it provided a new and interesting opportunity and incentive for industry to go out for maximum exports. "I think they will succeed," he said. "It is the first time it has been able to do this without having to slow up because of the possibility, if not the certainty, of shortage of supplies at home.

Paramount Importance of Costs

Steelmaking costs thus became of paramount importance, Sir Cyril added. A variety of factors was involved—cost of materials and fuel (particularly of coal), provision of larger ships and wagons and improved port facilities, cheapening of the capital cost of steel plant, and restraint on wages. On these would depend whether the industry would be able to cash in on the new situation. "All this means that the emphasis in the next few years will change from that of the last decade—the need to expand output. We have got to improve efficiency and reduce costs and therefore we shall see by 1965 that these factors are the ones which will determine problems of policy."

The report recalls that in 1957 the board took the view that the industry should aim at having a productive capacity of 29,000,000 ingot tons by 1962. For a time during the recession of 1958 it seemed that that capacity might not be achieved, but with the expansions now in hand there was every prospect that 29,000,000 ingot tons would be produced next year if required.

Having dealt with the evolution of demand from 1957 to 1960, the report turns to future demand and capacity. The board believes that the expansion of the iron and steel industry ought to be sufficient to meet the requirements of a more rapid economic growth than there has been in recent years. The growth rate assumed is 3.2 per cent. a year increase in gross domestic product or 2.8 per cent. per head of working population.

On these reasonably optimistic assumptions, the crude steel requirements in 1965 may be of the order of 23,250,000 to 23,500,000 tons at home and 5,250,000 tons for export. Some 250,000 tons is likely to be found from re-usable steel available for re-rolling. With home supplies available from an efficient and competitive industry, imports are likely to be confined to special requirements. This gives a net total of about 29,000,000 tons.

In suggesting the capacity that is appropriate for each main product, an allowance is made over the calculated demand for a margin to meet sudden increases in demand, unforeseen interruptions in production, or other contingencies. In all the circumstances the board considers 32,000,000 tons to be the appropriate ingot capacity in 1965.

At the present moment capacity in existence and schemes approved amounts to 34,000,000 tons, and further schemes under consideration should produce a further 500,000 tons. (Production in 1960 was 24,300,000 tons and capacity 25,500,000 tons.) However, existing capacity includes some 2,500,000 tons which may well be uneconomic by 1965 and which, if so, ought to go out of production as soon as the demand can be met from new and more modern plant. The amount of reasonably modern and efficient crude steel capacity in 1965 is thus likely to be close to the 32,000,000 tons which the board considers appropriate.

The 1957 report emphasized the need for increased semi-finished steel capacity. An adequate supply of billets can now be foreseen, based primarily on developments at plants using home ore. Production of special, alloy, and forging quality billets is planned to increase and, although re-rolling capacity for light products is being increased at integrated works, there should be adequate billet supplies for independent re-rollers and dropforgers. There is still some obsolete billet capacity, but it should not be required for long.

Dealing with the requirements of raw materials the report envisages a slight reduction in the proportion of scrap used in steelmaking through the use of pneumatic (LD, Kaldo, and Rotor) processes, and

home supplies should be adequate without imports on the two alternative levels of steel production of 29,000,000 and 32,000,000 tons.

To produce 29,000,000 tons of steel 20,000,000 tons of pig-iron will be required, or 22,250,000 tons for 32,000,000 tons of steel. The potential production from existing capacity and approved schemes is over 23,750,000 tons, with possibly 1,000,000 tons from schemes in contemplation. Uneconomic capacity may exceed 1,500,000 tons and could safely be withdrawn.

The future use of home iron ore, which should increase steadily in the 1960s, has been reviewed by a special committee appointed by the board in December, 1958. Substantial increases in extraction are foreseen, particularly from the Frodingham and Northampton Sand fields where they will be needed primarily in support of additional capacity for iron and steel in those areas. These expansions accord with the board's policy for the maximum economic use of home ore resources.

Imported ore requirements are estimated at 24,000,000 and just over 27,000,000 tons on the two alternative levels of steel production. The substantial increase on current imports of about 18,000,000 tons a year is expected to come mainly from Sweden, Canada, and West Africa.

So far as ore shipping is concerned, because of the economies involved, the Iron and Steel Board would like to see larger ore ships used. The number of ports available for them is limited, but substantial improvements have been made, or are planned, in the UK.

Fuel Prices

The board is forthright on the subject of fuel prices. Pointing out that its future competitive position is vitally dependent on securing coal that is competitive in price, it recalls that in preparing the 1957 report it was informed that there were no grounds for believing that the average cost of coal in the UK would go up more than in other countries. US coals had actually fallen in price, partly because of lower freight rates. In relation to continental coal this expectation was, until recently, fulfilled, but last autumn UK coking coal prices were increased by about 10 per cent. and to this extent the previous relationship between comparable UK and continental coking coals was changed—a change partly offset by the revaluation of the Deutschmark. However the NCB has expressed the opinion that the future position of the UK coal industry would, in the years to come, be much improved by the fact that reconstruction projects are now beginning to show results.

Fuel economy has improved following the growing use of prepared burdens (sinter) in blast furnaces. Experiments in injecting oxygen and fuel (oil or pulverized coal) into blast furnaces will, if successful, give still greater economy. The pneumatic steelmaking processes do not need external fuel and fuel efficiency is thus improved.

Larger electric arc furnaces have led to economy in capital costs and attract relatively favourable rates for electricity because of the large and continuous load involved, coupled sometimes with arrangements for limited shedding of the load at bulk periods. This makes it possible to use them for bulk steel production, especially in the Midlands and Sheffield where electricity generation costs are lower than elsewhere. Some 250,000 tons of oxygen was used in 1959 and this may rise to 2,000,000 tons by 1965.

Dealing with foundry capacity, the board states that development does not require its content, but it has a duty to review the capacity and raw material requirements. Ironfoundry production is estimated to increase from 3,700,000 tons in 1957 to 4,000,000 tons in 1965, *i.e.*, by 7½ per cent., compared with 26 per cent. for steel. Given high activity in the motor and shipbuilding industries, demand in 1965 would reach 4,250,000 tons. The consumption of steel castings in the UK is estimated to reach 341,000 tons in 1965, compared with 296,000 tons in 1957.

The location of plant strongly influences the economics of its operation, since raw materials and transport form a high proportion of total costs. The economies from integration are therefore emphasized. The increased capacity is not expected to require significantly more labour. New plant is about twice as productive as existing plant.

Specially designed high capacity wagons now in use permit up to 900 tons of imported ore to be carried in one trainload and the board feels that the adoption of larger ore and coal wagons as standard practice by British Railways would have considerable advantages.

Towards lessening the capital cost of steelmaking plant, the report urges the acceptance of standardized designs to save time and money. The highly complex modern steelworks can be built as quickly as the simpler pre-war plants and, providing the cost of fabricating iron and steel works plant can be obtained within reasonable limits, progress in the more effective use of plant may reduce the present heavy capital cost per ton of product.

Between 1953 and 1960 the industry spent £679,000,000 on development, the highest expenditure in a single year (£146,000,000) was in 1960. Total expenditure in the period 1961 to 1965 may be between £600,000,000 and £700,000,000.

In conclusion the report looks further ahead and states that, although estimates of capacity in 1970 must be highly speculative, about 35,000,000 ingot tons may be required and, given favourable circumstances, at least 1,000,000 tons more. As regards individual products, increasing emphasis on sheet and strip (particularly alloy and stainless) tinplate for canning, ferro-concrete bars, and light sections may continue.

It is impossible, the report confesses, to forecast accurately the ultimate contribution to capacity and efficiency of the new processes. While plant already existing or under construction may have an enormous potential, it is reasonably certain that after 1965 substantial increases in output will be achieved for relatively modest capital expenditure.

SCOW Chief to Become Chairman of Lloyds Bank

CHAIRMAN of the Steel Company of Wales, Limited, Mr. Harald Peake, is to succeed Sir Oliver Franks as chairman of Lloyds Bank, Limited. Mr. Peake, who is 61, has been chairman of SCOW since 1955 and will give up the chairmanship after the annual general meeting in February, 1962, to enable him to take over as Lloyds Bank chairman that month. At the meeting, Mr. Peake's re-election as an ordinary director of SCOW will be proposed.

In the meantime Mr. Peake, who is also a director of Rolls Royce, Limited, and a member of the boards of a number of insurance and banking houses, will become a deputy chairman of Lloyds Bank jointly with Sir Jeremy Raisman, hitherto sole deputy chairman. Sir Oliver Franks, who has been chairman of Lloyds Bank for the past seven years, is resigning to take up the appointment of provost of Worcester College, Oxford.

Coal Imports Plea

CURB COULD "UNDERMINE" STEEL INDUSTRY

URGING the adoption by the National Coal Board of a policy of "flexibility" regarding coal imports, Sir Julian Pode, managing director of the Steel Company of Wales, Limited, said last week that "nobody wishes or intends to inundate the country with imported coal, but we must assure the competitive virility of the steel industry." The fact that British steelworks on the coast were not at the present time allowed to import coal was a "considerable blow" which in time would undermine their competitive position. Many of the ECSC countries imported coal, and a measure of flexibility would be an excellent stimulus to UK industry.

Sir Julian, who was addressing the annual luncheon of the Institute of Fuel in London, said that industry, and particularly the steel industry, also suffered from another difficulty, which was that the more modern methods of mining now so largely employed made it difficult to produce large coal for locomotives and the traditional household fire.

SIR JULIAN PODE

"Some of us think that this commodity of large coal should be sold at a considerably enhanced price, with a view to the industrial coal being sold cheaper," Sir Julian said. Noting that Mr. Alfred Robens, chairman of the NCB, was concerned with augmenting the efficiency of the coal industry by further mechanization, he added: "I think it is up to us all who have connections with the fuel industry in any way, to support this programme to the greatest possible extent, and I wish Mr. Robens and the Coal Board all good fortune in this endeavour."

Influence of Institute

Sir Julian said traditionally the people of this country were extravagant in their use of fuel because for centuries they have enjoyed the most ample and cheapest supply of coal of any country in Europe. The first World War and still more the second showed that this extravagance rested on an insecure foundation and that fuel supplies which, until recently had meant coal almost entirely, were in jeopardy.

"We were, therefore, forced by war into the practice of fuel economy and this led to a much wider and more important movement, that of fuel efficiency. Only an actual shortage could have persuaded most industrialists that they had to become efficient in fuel utilization because in so many industries the percentage of the cost of production represented by fuel is so small." The heavy industries were not in that category, and the steel industry had been a major contributor to developments in fuel efficiency. It had gone to considerable trouble and expense to improve techniques and the achievement had been great. For instance, in 1920 over three tons of coal or its equivalent were required to make a ton of finished steel—now it was half that amount.

A point had now been reached at which there was a glut of coal, and fuel oil had become highly competitive in price; a situation which the Government now proposed to remedy. One could not help sympathizing with the Coal Board for, with an extractive industry, it was difficult to adjust output quickly whether upwards or downwards. The sudden down-turn in demand for coal in 1957 forced the board to maintain a volume of output greater than it could sell and to stock the surplus coal while plans were being devised for reducing the scale of production. The social problems involved in contraction were exceedingly serious and, working as he did in the midst of a great coalfield, he was acutely conscious of these difficulties.

In his view, underlying the economical use of coal there was the price question. The steel trade was vastly concerned in export business as the principal supplier of the engineering and metal goods industries, which themselves were responsible for 48.9 per cent. of the exports of the country, added to which there was the direct export of steel. In the tinplate section of the Steel Company of Wales, exports were as high as 40 per cent. and the company altogether gathered in £34,000,000 per annum from export business.

"These markets are getting more and more competitive, and our competition by no means only arises from the traditional centres such as the Ruhr, France, and Belgium—we now have efficient plants at Cornigliano in Italy, Hoesch in Bremen, Royal Dutch at Ijmuiden, and so on. All these centres of steelmaking have available to them imported ore and imported coal to the coastal points. The British steelworks on the coast have, of course, equal facilities for importing ore, but, in fact, they are not at this moment allowed to import coal and thus suffer a considerable blow which, in time, will undermine their competitive position."

In his reply, Dr. Angus Macfarlane, president of the Institute, said he believed the country should harness its resources properly in order to ensure throughout the '60s that the major part of Britain's energy requirements was met, as it could be, by British coal. This not only called for the NCB to continue its drive to produce coal more efficiently and cheaply . . . it also meant that far greater efforts must be devoted to coal science and coal technology.

"I know that has been said before—and nothing much has happened. What I want to emphasize is that this is perhaps the last hour that the plea can be made—if the results are to be available in time."

Appointments

Deputy Chief Engineer for Holman Group

MINING and quarrying machinery manufacturers, Holman Bros., Limited, of Camborne (Cornwall), has appointed Mr. STANLEY PARNELL deputy to the chief engineer, Mr. James Hodge. Mr. Parnell joined Holman in 1929 as a scholarship apprentice, and in 1934 after a period as a draughtsman, was appointed foreman in charge of the compressor, air engine and hoist test shop.

MR. S. PARNELL

Mr. Parnell was transferred in 1942 to the planning staff formed to set up the Polsten anti-aircraft gun factory, later becoming shop superintendent. In 1944, he was transferred to Holman's Glasgow office as branch manager. He went to Canada in 1951 to join Holman's associate company, Holman-Vulcan, Limited, and on re-formation of the wholly-owned subsidiary, Holman Bros. (Canada), Limited, became first joint manager and then general manager.

He returned to England in 1956 as chief stock controller, and since 1958, when the group design and technical staff was transferred to the newly-acquired Climax Works at Carn Brea (Cornwall), he has been in charge of the technical office.

Mr. GRAHAM MILLER has been appointed home sales manager for Wayne Kerr Laboratories, Limited, electronic engineers of Chessington (Surrey). He joined the company two years ago as sales engineer for the North of England.

From Monday Mr. C. J. BUCHANAN-DUNLOP becomes manager of the Birmingham area sales office of Alcan Industries, Limited, in succession to Mr. D. W. Taylor who is to take over management of the London area sales office later this year.

A member company of the Sheepbridge Engineering Group, Sheepbridge Equipment, Limited, Chesterfield, has appointed Mr. C. E. HUTCHINSON, as general sales manager. He has had many years experience in the engineering industry.

Latterly manager of the purchase division, Mr. BERNARD WILLIAM LYNN, who joined F. Perkins, Limited, the Peterborough diesel engine firm, 25 years ago, has been appointed general planning and procurement manager for the group.

Mr. J. C. CHILDS has been appointed works manager of Sheepbridge Stokes, Limited, Chesterfield, a member company of the Sheepbridge Engineering group. Mr. Childs was previously with an associate company, Sheepbridge Alloy Castings, Limited, as methods engineer.

Mr. NORMAN T. SIMMONS has been appointed divisional chief scientist in the South Western Division of the NCB. For 14 years Mr. Simmons has been chief scientist in the No. 5 (Rhymney) Area of the Division. Previously he was chief chemist at Powell Duffryn, Limited, and is a Fellow of the Royal Institute of Chemistry, a Fellow of the Institute of Fuel, and an associate member of the Institution of Mining Engineers.

Mr. H. K. HARTLEY has been appointed general sales manager of Fawcett Preston & Company, Limited, a member of the Metal Industries Group. He has been with the company since 1940, and was appointed sales manager of the rubber and plastics division last year.

Manager of West Wylam and Hedley Collieries, Northern (N&C) Divisional Coal Board, for 23 years, Mr. R. W. ORD has been appointed manager at Burradon Colliery (Northumberland). Mr. J. BRADY, previously manager at Ventners Hall Colliery (Northumberland), is the new manager at Hedley pit.

Yorkshire NACM Members in the Ruhr

THIRTY-SEVEN members of the Yorkshire branch of the National Association of Colliery Managers arrived home on Saturday after spending a week in Germany, where they visited Ruhr collieries and the works of mining machinery manufacturers. The party had left Doncaster on the previous Sunday, arriving in Essen on the Monday evening.

The programme in Germany was drawn up by Steinkohlenbergbauverein after initial contact by Mr. E. J. Kimmins, production director of the North-Western Divisional Coal Board, and the party was organized by Mr. H. Kidd, secretary of the Yorkshire branch.

The members were entertained at dinner by Steinkohlenbergbauverein on their arrival in Essen. They divided into two groups for the various visits. On the Tuesday morning the members went underground at the Mine Pattberg of Rheinpreussen AG für Bergbau und Chemie in Repelen and the Mine Friedrich Heinrich of Steinkohlenbergwerk Frederich Heinrich AG in Kamp-Lintfort. In the afternoon there were visits to GHH in Oberhausen-Sterkrade and Becorit Grubenausbau GmbH in Recklinghausen.

Members went underground at the Mine Minister Stein of Dortmunder Bergbau-AG in Dortmund and the Mine Monopol of Monopol Bergwerks GmbH in Kamen on the Wednesday morning, the afternoon being devoted to a visit to Gewerkschaft Eisenhütte Westfalia in Lunen. The party again went underground on the following morning—at the Mine Consolidation of Essener Steinkohlenbergwerke AG in Gelsenkirchen and the Mine Westerholt-Bermannsgluck-Polsum of Bergwerksgesellschaft Hibernia AG in Westerholt. A visit to Maschinenfabrik and Eisengiesserei Gebr. Eickhoff, Bochum, was made in the afternoon.

The NACM party was entertained at luncheon each day by the management of the mining companies visited, hospitality being extended for dinner each evening by the management of the mining machinery firms visited.

HALESOWEN STEEL COMPANY, LIMITED—The year to December 31, 1960, started well with a lengthening order-book and a strong demand for the company's products continued until the autumn when the recession in certain industries caused a fall in activity which persisted to the end of the year, states Mr. P. H. Jones, chairman. Trading so far during the current year gives no cause for pessimism. The value of orders is being maintained at a satisfactory level, and there are indications that production will continue at a profitable level, says the chairman.

Law Cases

SALE OF "KNOW-HOW"

Rolls-Royce Receipts Subject to Taxation

HEARING began on Tuesday in the Court of Appeal into appeals by the Crown from a decision of Mr. Justice Pennycuick in the Chancery Division holding that payment to Rolls-Royce, Limited, by foreign governments or companies for "know-how" to enable them to manufacture Rolls-Royce jet aero-engines arose from the sale of a capital asset and was excluded from the computation of the company's profits.

The judge had dismissed, with costs, four appeals by the Crown against decisions of the Special Commissioners for Income Tax allowing appeals by the company against assessments to income-tax, excess profits tax, profits tax, and excess profits levy arising from the sale of technical knowledge. The appeals concerned assessments on the company's profits amounting to more than £15,000,000 for the years 1948-55.

Mr. Roy Borneman, QC, for the Crown, said that Rolls-Royce had acquired a great fund of technical knowledge, or "know-how," and over a long period of years had used this not only in the manufacture of its own engines, but also by selling it under agreements to various people and governments. The Crown contention was that anything which a company received as a reward for giving away, disposing of, or allowing other people to use what it was itself using, was a receipt in the ordinary way of its trade. The amount of income-tax involved in the case, he said, was about £500,000.

"Regular Feature of Trade"

The company's argument, he said, was that it was a capital receipt and not a trading receipt. It said a fund of knowledge of such nature must be a capital asset. If a piece of it was sold, it must be a capital receipt and the nature of that receipt was not changed by repeating the sale of knowledge *ad infinitum*.

Mr. Borneman submitted that the sale of "know-how," repeated many times, became embedded in the trade and was part of the trading operation. The amount received was as much a trading receipt as for selling any sort of aircraft engine. It was a regular feature of the company's trade, and the whole process was a continuous growth of specialized knowledge on how to do things. Whether the payments were by lump sum or royalty or both, they were all equally trading receipts which should go straight to the trading accounts as much as a receipt when the company sold an engine to BOAC.

Lord Justice Holroyd Pearce said that the knowledge sold by Rolls-Royce was not some transient by-product of advancing engineering science. It accrued automatically from the company's business of manufacture and in a comparatively short time was superseded and lost its value. It was the kind of knowledge which could easily merge its character of a fixed asset into that of a trading asset.

His lordship was compelled to the conclusion that the receipt of the sums in question was part of the annual profit or gain accruing from the company's trade. Lords Justices Upjohn and Donovan agreed in allowing the appeal with costs.

Leave to appeal to the House of Lords was given.

£5,300 Award Against NCB After Judge's Ruling

ACTION brought by a mineworker against the National Coal Board at Leeds Assizes which could have been regarded as "out of time" was allowed to continue by Mr. Justice Megaw because of what he called "curious circumstances." The action was brought by Mr. Stephen McCann (23), dust sampler, for injuries received on June 8, 1955, at Sharleston Colliery (Yorks), when he was struck in the back by a set of tubs while employed as a haulage hand. Awarding him special and general damages of £5,311, the judge said there had been no contributory negligence on his part.

In his judgment, the judge said that in the normal way, because the writ in the action was not issued until July 30, 1958, the defendants could have relied on the Limitations Act, 1939, as amended, and have found a complete defence by saying that the action was not started until more than three years after the accident. Mr. McCann, however, had recently become aware that the people he had lived with since a child were not his parents but an uncle and aunt by marriage. His mother had died when he was two days old, and his father was left with eight other children, so McCann went to the uncle.

"Because it is now conceded that McCann was not in the custody of a parent between the date of his accident and the issue of the writ, it follows that he is not debarred from bringing his action, because in such a case a plaintiff is allowed a year after achieving his majority in which to start the action."

Steel Company Fined for Oil Pollution of River

FOR allowing oil to be discharged into the River Tees from its works at Cargo Fleet, Middlesbrough, the South Durham Steel & Iron Company, Limited, was fined £300 with 30 guineas costs at Middlesbrough. The company pleaded guilty. Prosecuting for the Tees Conservancy Commissioners, Mr. A. R. Tate said the firm had caused the most serious

pollution of the river since the new Pollution Act was introduced six years ago. An official of the commission found a concentration of oil over half an acre, two or three inches thick, covering the entrance to a graving dock. "It was so solid that when a workman threw in a brick it did not sink." A thousand feet down river fishermen had to cut away their gear, and one boatman described seeing an "island" of oil floating out to sea.

Mr. J. A. Wintersgill, for the company, said it could only be assumed that a new man on his first shift in the pump house must have been confused by all the valves and accidentally opened the wrong one.

The stipendiary, Mr. A. P. Peaker, directed that £100 of the fine should be paid to the commissioners.

SHOTFIRER FAILED TO WARN MEN

FOLLOWING a shotfiring incident at Wellesley Colliery, Methil, Fife, when two men were injured, Douglas James Sanson (39), shotfirer, was fined £5 at Kirkcaldy Sheriff Court after being charged with failing to cause due warning to be given to the two men.

The fiscal said Mr. W. Gorman and Mr. C. Martin were developing a road. Another road was being worked to meet that one. Sanson asked a man to act as sentry in one direction, but apparently forgot to withdraw the two men from the other side of the face. The explosion blew through the wall, injuring the men. Sanson said in court he thought at the time he had nine to 11 yds. to go through.

TWO JAILED FOR STEEL THEFTS

TWO lorry drivers involved in a conspiracy to steal large quantities of metal from the Steel Company of Wales, Limited, were each sent to prison for 18 months at Glamorgan Assizes. They were Harold Wilkins (28), and Peter Edward Thomas (36). Both pleaded guilty to conspiracy. Thomas also pleaded guilty to stealing four mild steel plates on March 23, and Wilkins to stealing a quantity of steel plates on April 14.

Both pleaded not guilty to other charges and these pleas were accepted by the prosecution. Mr Justice Davies said that a huge amount of £11,000 was involved. "It is apparent that the system of issuing steel plates was defective in the extreme," he added.

AWARD TO MINER'S WIDOW

AT Leeds Assizes Mr. Justice Megaw awarded £2,956 damages and costs to Mrs. Charlotte Rickson against the National Coal Board. She claimed for the death of her husband, Mr. Fred Rickson, a drawer-off, who was killed in a roof-fall at North Gawber Colliery (Yorks), in 1956.

The Judge said that Rickson was a careful workman of long experience, but on the day of the accident had failed to take the steps he ought to have taken for his own safety. He held that Mr. Rickson had been one quarter to blame for the accident.

£8,550 AWARD FOR FOUNDRYMAN

DAMAGES of £8,550 were awarded at Staffordshire Assizes against Dudley & Dowell, Limited, ironfounders, of Cradley Heath (Staffs), in favour of Mr. Cyril Mason (42), who was injured in an accident at the company's works in 1957.

Mr. Justice Finnemore said that Mr. Mason, part of whose job was to fetch molten metal, struck his knee in passing between a conveyor and a dobbin, and in stopping sharply sustained an injury which affected his spinal cord.

Northern Coalfields' Drive in Spring Sales Campaign

PROMOTION of the merits of solid fuel through the national and local Press and by means of show houses, displays and exhibitions will feature in the drive by the Durham and Northern (N&C) Divisions of the National Coal Board to give full support to the industry's spring sales campaign, inaugurated by Mr. Alfred Robens, NCB chairman, on April 5. There are also to be organized visits of specialists, such as heating engineers, architects, and others to the new NCB Heat Service Centre in Newcastle, where the latest appliances can be seen in operation and expert advice is available on every form of domestic and industrial heating.

Visits are also being arranged to other points where examples of modern efficient solid fuel central heating and automatic industrial appliances can be seen under fire and in operation. The timing of the sales drive will be closely related to the fact that it is during the next few months that householders will be considering changing over to central heating systems, and it is intended to take every opportunity to bring to the public the advantages of North-country coals and Sunbrite, as well as other solid fuels, when they are burned in the modern way, in modern equipment.

The campaign, says a spokesman, will "express the determination of the two divisions to fight for a major share in the fuel and power markets, based on a modern, progressive coal industry," and will be based on increased efficiency in production, coal preparation, sales and distribution. "The trend is in our favour, and we intend to keep it so by giving the public quality, price stability and service, by pushing the advantages of modern coal-burning equipment in every possible way, and by demonstrating that whatever the heating problem, coal will do the job."

In May, the Durham Division will open its new Heat Service Centre in Darlington.

Work "For Next 100 Years" at £9,000,000 Scots Colliery

ONE of Scotland's most modern collieries, Killoch (Ayrshire), was described last week by Mr. R. D. Glass, general manager of the West Ayr Area, Scottish Divisional Coal Board, as "an insurance against redundancy and unemployment in the industry in Ayrshire." The new colliery which, when in complete production, will have cost £9,000,000, will provide work for 3,500 miners for 100 years.

Designed to produce 1,500,000 tons of coal a year, it is being worked largely by men transferred from pits which have been closed. The colliery went into production at the beginning of this year and present output is 1,000 tons daily.

Mr. Glass expects that by 1965 Killoch will be producing 5,000 tons a day, but whether this figure will increase after that date will depend largely on conditions underground, demand for coal and the availability of men.

DURING A FIVE-DAY visit to Wales, eight members of the Imperial Defence College last week toured the Lady Windsor Colliery, Ynysybwl (Glam), and the Ebbw Vale steelworks of Richard Thomas & Baldwins, Limited.

Towards Cheaper Coal

Mechanization May Reduce Costs in Five Years

BENEFITS expected to result from the National Coal Board's big mechanization drive were stability of prices and the possible fall in costs in five years' time, said Mr. Alfred Robens, NCB chairman, at Newcastle-upon-Tyne, on Thursday of last week. He told the northern region of the National Union of Manufacturers that although the fringe of mechanization had been barely touched, this year's programme in the coal industry was more than double that of any other single industry. The effect of this mechanization would be to absorb the increases that would normally occur.

Mr. Robens said: "When I have gone—in another five years' time—if I go—I think the scene will be set for another five-year programme which could bring down fuel prices because by 1965, as a result of this mechanization, we shall be producing 80 per cent. of the coal required by the nation in its various forms from either brand new pits or newly reconstructed pits, and in these we shall have mechanization to the *n*th degree of the coal face to the shaft."

The advantages which had come to the industry through the budgetary increase of 2d. a gallon on heavy oil, equal to an increase of 23s. a ton on coal, did not mean that the Coal Board would sit back, he said. It would go on intensifying its efforts to provide British industry with coal at the lowest possible prices.

Warning to Oil Users

Mr. Robens warned industrialists and manufacturers using, or thinking of changing to oil, that they might face difficulties in the future. "Those who have turned to oil must face the fact that they will not be able to switch back quickly if they want to do so. If there should be a political or foreign crisis causing an interruption of oil supplies, the coal industry would give service to its customers.

"Those who left us and want to come back will have to wait," the chairman asserted. "We have kept good customers and we want to make sure that those who help us over the next two years will get service and quality of product in return."

Mr. Robens told the manufacturers that the board's policy now was to provide British industry with heat at the cheapest possible price. The most important thing the board could do was to look after its customers, who by the efficiency of their products would determine the standard of living of the nation. What the coal industry needed more than anything, however, was time. Coal should not now be got at any price; that was too expensive. "I hope that we will be able to make a move this year to give you long-term contracts consistent with products and technical services, he said. If we can have time—and I contend we need two years to modernize pits—and your help and your trade for this period, we will be able to do it."

On the same day as Mr. Robens' visit to the North, Mr. Richard Wood, Minister of Power, denied that the new tax on heavy oil was intended to give protection to coal rather than to raise revenue. Opening a new oil tanker terminal at Milford Haven, he said it had been suggested that it was naïve to suppose the purpose of the oil tax was to raise revenue and not to give protection to coal. "I emphatically deny this, and willingly accept the charge of naïvety, because I am convinced that coal is in no need of such protection." In the later 1960s, he said, it was estimated that two thirds of the inland energy demand would be met by coal.

Commenting on the oil tax before making a tour of Hugh Wood & Company, Limited, mining machinery manufacturers, of Gateshead, Mr. Robens said he accepted what the Chancellor had said that this was not designed to protect the coal industry, but was for the specific purpose of raising revenue. The tax, however, would naturally have an effect on industrialists who were thinking of changing from coal to oil for economic reasons, who would probably have another look at their proposals. The tax was "not a signal for us to let up one little bit." With Mr. Robens on the tour of the factory were Dr. William Reid, chairman of the Durham Division of the NCB, Mr. Hugh Wood, managing director of the firm, and the works director, Mr. Fred Bainbridge.

Determination of the board to keep its valuable market of 30,000,000 tons of domestic solid fuel a year was emphasized by Mr. Robens in London last Friday. He had travelled overnight from Newcastle where, as part of the domestic central heating campaign being initiated by the board and the Coal Utilization Council, he had opened a newly-built semi-detached show house equipped with solid fuel central heating.

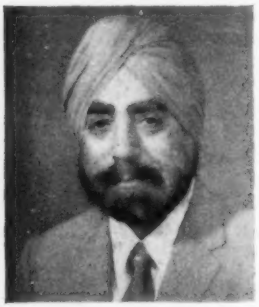
Mr. Robens said that reports from all over the country showed the outstanding success of the board's drive for central heating. Paying tribute to solid fuel appliances the housewife can have her home partially to efficient heating, Mr. Robens said: "With modern appliances the housewife can have her hofe partially or fully central-heated for little more than her present outlay on the fuels she uses in old-fashioned appliances."

Previously, Mr. Robens had opened an old Victorian house in Pimlico, S.W., newly-converted into two maisonettes and a bedsitting room equipped with modern solid fuel appliances for space and water heating and, in one case, cooking.

WITH A TOTAL of 92 points, a team representing the West Fife Area of the Scottish NCB, has qualified for the finals of the Scottish Civil Defence training competition. The national competition, organized by the Scottish Home Department, will take place in May.

Chief Inspector of Mines in India

MEMBER of the Mines Inspectorate of the Government of India since 1937 and additional Chief Inspector of Mines for the past two years, Mr. G. S. Jabbi has been appointed Chief Inspector of Mines to succeed Mr. S. S. Grewal who retired on April 14.



MR. G. S. JABBI

Mr. Jabbi graduated from the Indian School of Mines, Dhanbad, in 1927, with a first-class associateship in mining engineering and gained his first-class mine manager's certificate in 1934. Before joining the Mines Department he worked at Sripur and Bagdigih collieries of Turner Morrison, Limited. He was promoted circle inspector of mines in 1946 and deputy chief inspector of Mines in 1954. He has studied mining techniques and problems in the US and was a member of the first Government of India team of engineers, sponsored by UN technical assistance administration, which visited the USSR in 1955.

For the last two decades he has been closely associated with the development of the mineral industry of India and with rescue and recovery work in mines. Among very many offices he has held in connection with the industry are:—President of the Central Coal Mines Rescue Stations Committee, member of a number of committees of the Coal Board and the Central Mining Research Station, vice-president of the Mining, Geological, and Metallurgical Institute of India, chairman of the Government's Mine Safety Education and Propaganda and Mine Safety Equipment committees and recently he was appointed chairman of the Technical Committee on Problems of Dust in Mines.

Mr. Grewal is to take up an appointment as chief mining adviser to the Government of India's Railway Board. The first Indian to be appointed Chief Inspector of Mines, he has held the post with distinction for the past seven years. He, too, has played a prominent part in the development of the industry in India and during his chairmanship of the sub-committee on Safety in Coal Mines has seen the fatality rates almost halved. He has served as president of the Central Coal Mines Rescue Stations Committee, the Board of Mining Examinations, the executive committee of the Indian School of Mines, and as chairman of the Joint Mining Education Advisory Board, Bihar and West Bengal, the technical committee on Standards of Mine Ventilation and Lighting, and other committees. He is a past president of MGMII and a member of the Government committee on amalgamation of collieries, and also of the Coal Board.

Mr. Jabbi is succeeded as additional chief inspector of mines by Mr. R. G. Deo, formerly deputy chief inspector at Sitarampur.

UNDER THEIR CONDUCTOR, George Hespe, the band of Yorkshire Imperial Metals, Limited, London, E.C.4, won the final of "Northern Brass," the BBC band competition, at Leeds Town Hall last Saturday.

European Coal Output

THE appended figures relating to coal output and imports are taken from statistics issued from Geneva by the Coal Committee of the Economic Commission for Europe.

Tonnages are metric, and the number of underground workers employed relates approximately to the end of the month.

TABLE 1.—*European Coal Output (Metric Tons) and Employment.*

Country.	Output.		Underground employment.	
	January, 1961.	December, 1960.	January, 1961.	December, 1960.
Belgium	1,333,000	1,731,000	77,000	77,000
France	4,767,000	4,734,000	124,000	125,000
Italy	48,000	62,000	—	—
Netherlands ..	1,170,000	1,097,000	28,000	28,000
Poland	9,036,000	9,092,000	216,000	215,000
United Kingdom ..	15,285,000	18,580,000	466,000	466,000
Spain	—	1,147,000	—	—
Western Germany ..	12,430,000	12,129,000	297,000	297,000

TABLE 2.—*European Solid Fuel Imports in January, 1961, with Figures for December, 1960, shown in Brackets (Metric Tons).*

Importing country.	Coal and patent fuel.	Coke.	Lignite and brown coal briquettes.
Austria	342,000	61,000	49,000
	(325,000)	(78,000)	(79,000)
Belgium	285,000	10,000	8,000
	(391,000)	(23,000)	(6,000)
Denmark	374,000	170,000	25,000
	(449,000)	(147,000)	(26,000)
Finland	198,000*	20,000	—
	(462,000)	(25,000)	(—)
France	963,000	475,000	36,000
	(841,000)	(433,000)	(49,000)
Greece	12,000*	1,000*	—
	(10,000)	(—)	(—)
Eire	160,000*	—	—
	(141,000)	(1,000)	(—)
Italy	999,000	11,000*	18,000*
	(857,000)	(11,000)*	(17,000)*
Luxembourg	19,000	354,000	12,000
	(21,000)	(350,000)	(10,000)
Netherlands	642,000	40,000	24,000
	(665,000)	(31,000)	(43,000)
Norway	30,000*	56,000*	—
	(38,000)*	(58,000)*	(—)
Portugal	31,000	7,000	—
	(41,000)	(6,000)	(—)
Sweden	180,000	148,000	2,000
	(215,000)	(169,000)	(1,000)
Switzerland	136,000	21,000	19,000
	(137,000)	(30,000)	(24,000)
United Kingdom	—	—	—
	(—)	(—)	(—)
Western Germany	552,000	23,000	330,000
	(636,000)	(28,000)	(423,000)

* Secretariat estimate.

Retirement of North Staffs Colliery Manager

ONLY remaining colliery manager in North Staffordshire who was in office when the industry was nationalized in 1947 has retired. He is Mr. J. A. Preston, who completed 16½ years as manager of Stafford Colliery, Fenton, last week. He is 57, and is retiring for health reasons.

Mr. Preston, who worked in many collieries in Lancashire before going to North Staffordshire, has spent more than 44 years in the mining industry and is a member of the North Staffordshire branch of the National Association of Colliery Managers.

Blasting in Headings

APPLICATION OF RECENT DEVELOPMENTS

*by W. W. Rankin, F.H.-W.C., A.M.I.Min.E.**

Developments in explosives and blasting accessories and their application to shotfiring practice in headings are discussed in this paper, presented to the South Wales Branch of the National Association of Colliery Managers on February 9, 1961. The use of ultra-safe explosives is expected to be stipulated in pending new shotfiring regulations, and trials with these new explosives have been undertaken in South Wales. The tests are described and details are given of the results.

REGULATIONS governing shotfiring in British coal mines are very strict and sometimes not easy to interpret, even for those administering the law, but despite this, rates of drivage are still being gradually improved without any reduction in the high standards of safety.

The use of high-density gelatinous explosives, the shothole patterns, and the technique associated with fast drivages are well known and very high performances have been achieved in these circumstances in the South-Western Division of the National Coal Board as well as in other parts of the country.

The aspect of blasting in headings is one of increasing importance in the light of pending new regulations. The use of explosives and detonators is at present governed by the Coal Mines (Explosives) Order (1956), but the amendment of these regulations will introduce a new approach to blasting in headings which are following the seam. Recent developments in this field have been concerned both with the introduction of new techniques and the evolution of explosives and accessories of greatly improved safety. The amended regulations will make specific reference to this matter.

Developments in Explosives and Blasting Accessories

From 1950, a new attitude was adopted towards standards of safety in coal-mining explosives. It had been generally considered when testing permitted explosives, that the blown-out shot represented the most hazardous condition, but it has since been discovered that firing explosives in the presence of breaks in the coal or rippings is a much greater hazard. Tests carried out have shown that the underground conditions, represented by the angle-shot mortar test (Fig. 1) considerably reduce the charge limit associated with a given explosive.

After the war the work of developing explosives to meet these conditions continued and, in 1954, a new explosive designed to ensure the maximum degree of safety was introduced in Germany. The Germans finally achieved the application of the scientific principle of selective detonation to produce the German class 3 explosives[1].

The varying results obtained with these explosives indicates that the power developed is a function of the conditions under which they are fired. Selective detonation implies that under conditions of poor confinement, only the nitroglycerine detonates, leaving the sodium nitrate and ammonium chloride undecomposed but incapable of causing

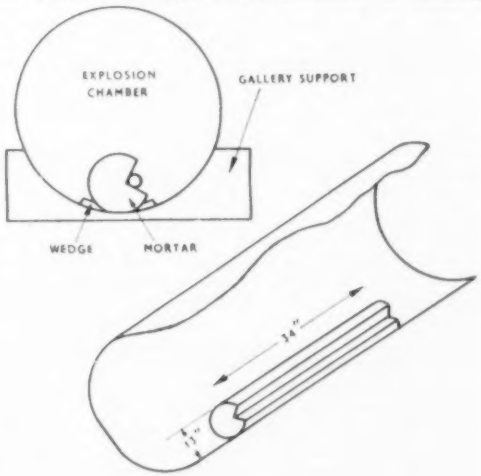


FIG. 1.—ANGLE-SHOT MORTAR TEST.

* Divisional explosives engineer, South-Western Divisional Coal Board.

delay detonation reactions. The following data indicates the performance of these explosives:—Strength confined, 33 per cent. B.G.; strength unconfined, 5 per cent. B.G.[2].

In this country, complaints of irritating fumes were responsible for such explosives being withdrawn. From then on, efforts to improve safety with coal-mining explosives have been concentrated on ammonium nitrate/fuel compositions with suitable flame inhibitors.

With reference to the development of safe explosives and the tests imposed upon them, it has been found that the principal factors which determine whether an explosive will pass these tests with gas present are the thermochemical properties of the composition and its density. The velocity of detonation has no effect on the results of the test. The conditions imposed on the thermochemistry and power of an explosive which has to pass the tests in gas have the effect of setting upper limits to the power of permitted explosives of any given type. Considering the explosives based on ammonium nitrate, the approximate maximum power of different densities is shown in Table 1.

TABLE 1.—*Approximate Maximum Power for Explosives Based on Ammonium Nitrate.*

Density.	Maximum power.
Gm./c.c.	Per cent.
1.5	59
1.15	65
0.98	66

This does not hold good, however, if the principal power-producing ingredient is nitroglycerine. In the case of such an explosive with density 1.5 gm./c.c. the power is approximately 54 per cent. This is associated with the fact that the decomposition of nitroglycerine is a much hotter reaction than the explosion of ammonium nitrate with combustibles[3].

Nearly all present permitted explosives contain ammonium nitrate as the chief oxygen provider for which it is admirably suited. It is cheap, does not have the disadvantages associated with the German class 3 explosives, and has the highly desirable feature previously mentioned.

It has been claimed that, with explosives based on ammonium nitrate/sodium chloride, the working capabilities are not so affected by the degree of confinement as with the exchanged ion compositions. Nobel's explosive 1235, with which trials are at present being carried out, has the following composition and properties:—Nitroglycerine and nitroglycol, 12.7 to 14.7 per cent.; ammonium nitrate, 32 to 35 per cent.; sodium chloride, 35.3 to 38.5 per cent.; calcium carbonate, 10 to 12 per cent.; bagassé or woodflour, 2.5 to 4.5 per cent.; calcium sulphate, 1.5 per cent., and clay, 1.5 per cent. The weight strength is 28.2 per cent. B.G., the density, 1.1 gm./c.c., and the velocity of detonation, 1,700 m/s. In trials with this explosive, however, undetonated cartridges have been found which had the appearance of having been desensitized in some way.

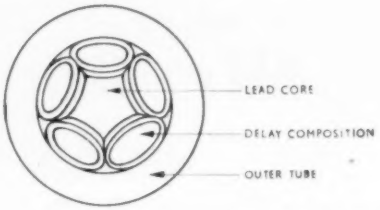


FIG. 2.—CROSS SECTION OF LEAD CORE DELAY ELEMENT.

Detonators

It is well known that short-delay detonators when freely suspended in methane air mixtures will ignite gas, but that they are completely safe when placed in a primer cartridge. Both from the application and manufacturing point of view, the first type of non-incendive short-delay detonator was unsatisfactory. It had a nominal delay period of 50 milli sec. Finally, the lead element delay detonator (Fig. 2) was produced and this has proved most satisfactory.

In the lead element or Carrick delay detonator, the delay element consists of a central lead cradle which carries five tubes of lead containing the delay element composition, all enclosed in a lead sheath. The composition of the fuse head is also modified. The series has the following nominal delay times:—No. 0, nil; No. 1, 30 milli sec.; No. 2, 55; No. 3, 80; No. 4, 105; No. 5, 135; No. 6, 165; No. 7, 195; No. 8, 230; No. 9, 265; and No. 10, 300 milli sec.

It is expected that all short-delay detonators will eventually be based upon this design because of their extremely low incendive rate and suitable delay period. The range will, of course, have to be extended to provide suitable delay periods for use in cross-measure drifts.

The special submarine detonators originally used in pulsed-infusion shotfiring have been replaced by Hydrostar electric detonators. These detonators

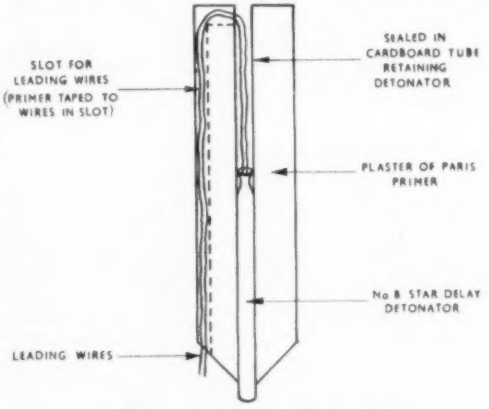

SLOT FOR LEADING WIRES (PRIMER TAPED TO WIRES IN SLOT)
SEALED IN CARDBOARD TUBE RETAINING DETONATOR
PLASTER OF PARIS PRIMER
No 8 STAR DELAY DETONATOR
LEADING WIRES

FIG. 3.—NOBEL INERT PRIMER.

have special underwater characteristics, due to their modified design which includes a thinner tube base, thicker walls, and greater initiating power.

More recently, with the introduction of short-delay detonators to pulsed-infusion shotfiring, the Hydrostar short-delay detonators have been produced and are available in delay numbers 0 to 3. It seems unnecessary to have a greater range at the moment, as the overall delay period permitted for firing in coal is 0.1 sec.

The leading wires of delay detonators other than the lead element delay type may be covered in an Alkathene sheath if desired. This sheath gives added protection to the leading wires and reduces the possibility of misfires due to short circuiting and earth leakage. Their value in saline and abrasive conditions is well known[4]. In connection with pulsed-infusion misfires, the use of an inert primer will be permissible. Fig. 3 shows the original Nobel inert primer.

Exploders

Types of exploders in common use in headings in collieries for multi-shotfiring are shown in Table 2.

TABLE 2.—*Types of Multi-shot Exploders in Common Use.*

Energy source.	Name.	Shots.	Approval.	Remarks.
Dry battery/condenser discharge	ME. 6	6	P	
Electronically modified dry battery/condenser discharge	Not yet known	12	Pending	In development.
Hand - driven/direct generator discharge	Schaffler 350	25	L	With 4 milli-sec. cut off.
Spring - driven/direct generator discharge	Schaffler 750	100	L	With 4 milli-sec. cut off.
Hand - driven generator/condenser discharge	Beethoven (modified)	100	L	4 milli-sec. cut off, now on trial.
Hand - driven generator / condenser discharge	Beethoven	100	N	No cut off.

"P" may be used in any place where shotfiring is allowed.
"L" may be used where non-permitted explosives are allowed, and with permitted explosives in stone mines, drifts, and sinkings provided certain requirements are observed. No special permission is necessary.
"N" may be used only where non-permitted explosives are allowed, unless permission is given by HM Inspector of Mines for use with permitted explosives in drifts, when certain requirements have to be observed.

No exploder may be used in a colliery unless it has been approved in accordance with the shotfiring Regulations, for the type of shotfiring being carried out, or unless special permission has been granted by HM Divisional Inspector of Mines.

Ignitions can be caused by sparking from shotfiring circuits in which multi-shot exploders are used if an explosive mixture of firedamp is present[5]. Sparking can be either pre-blast or post-blast.

Pre-blast Sparking.—A number of defects can be envisaged which might give rise to a spark as follows:—

(*a*) Partial short circuit between the bared conductors of the shotfiring cable, either directly or via roof arches, etc.

(*b*) A high-resistance joint in connection between detonator leading wires.

(*c*) Bared ends of the detonator leading wires, touching so as to partially short circuit a portion of the round.

Post-blast Sparking.—It is possible for sparks to be produced after the round has been fired by the wires of the circuit being blown together at a time when the exploder is still producing output. Experimental evidence indicates that the wires are not blown together in a less period than 10 milli sec. after the first shot has fired and, therefore, an exploder equipped with a 4-milli sec. cut off should not be the cause of post-blast sparking, even when using instantaneous electric detonators.

In view of pre- and post-blasting sparking, the following precautions are now being taken as far as drifts are concerned:—

(1) Apart from the gas testing laid down in the consent by HM Inspector of Mines, if the face contains a coal seam, the Inspector may specify points other than at the face where testing must be carried out at intervals not exceeding 24 hr.

(2) Under the "Notice permitting the use of an 'N'-type exploder" it states "no shotfiring cable shall be used with the said exploder other than cable which conforms to the specification approved by the Minister in his notice of "Approval of Shotfiring Cable," and joints between cables and detonators, and between each of the detonators shall be effectively insulated."

(3) The use of jointed cable is prohibited, and the insulation of all cables shall be maintained in good condition throughout. The scheme of maintainance shall provide for the weekly examination of such cables, by or under the supervision of the electrician of the mine.

(4) The eventual use of exploders with a time-limiting device.

(5) Omission of number "O" delays. This is an added precaution to ensure that all output from the exploder has ceased before there is a possibility of the wires of the circuit being blown together by the first shot to fire.

The most recent development in connection with stemming is the use of water ampoules in shotfiring holes together with conventional stemming. The water ampoule consists of a thin p.v.c. tube approximately 2 in. across the flat, and in lengths varying above 18 in. The original ampoule had to be tied at the neck, but this has been superseded by a self-sealing type much more convenient to handle.

Application of Blasting Practice in Headings

In the past, HM Inspectors of Mines have granted permission for the use of short-delay detonators with explosives other than ultra-safe explosives in rippings, and when a cross-measure drift is within 15 ft. of a coal seam exceeding 12 in. thick.

In the case of cross-measure drifts, the require-

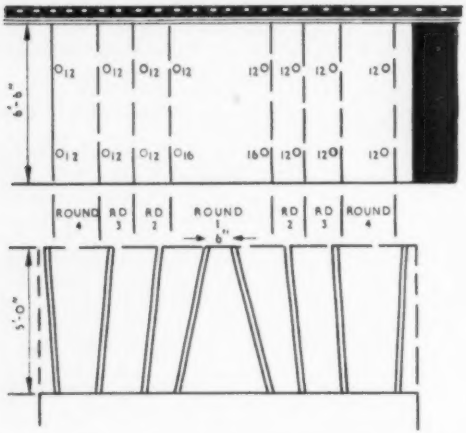


FIG. 4.—PULSED INFUSION SIMULTANEOUS SHOTFIRING IN A NARROW HEADING.

ments will remain substantially the same, but the new Regulations will specify that short-period delay detonators of a new ultra-safe type and a new ultra-safe type of explosive are permitted for the firing of rippings in accordance with certain restrictions laid down in the Regulations. In these conditions short-delay blasting gives certain attractive advantages with regard to safety and efficiency, but experience has shown that this method introduces conditions not previously experienced with former blasting methods. This technique provides the possibility of cut-offs producing angle-shot conditions and it has been deemed necessary in these circumstances to use ultra-safe explosives, which under the most stringent conditions even with charge limits in excess of those normally associated with permitted explosives, will not ignite gas.

It is not so many years ago that firing off the solid was not allowed except in anthracite. Leading up to the present position, consents to fire off the solid in coal other than anthracite required the use of single-shot pulsed infusion, and more recently multi-shot pulsed infusion has been allowed. Figs. 4 and 5 show two ways in which this can be done, and Table 3 gives charging details relating to Fig. 5.

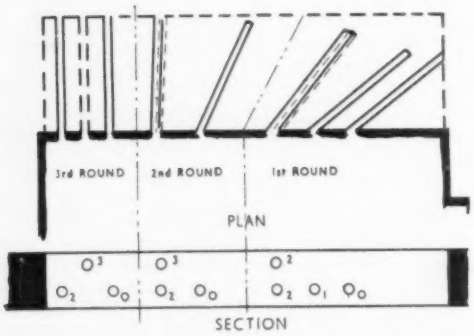


FIG. 5.—PULSED INFUSION, SHORT-DELAY SHOTFIRING IN STABLES.

TABLE 3.—*Charging Details for Pulsed Infusion, Short-delay Shotfiring in Stables.*

	First round.	Second round.	Third round.
Weight of charge (bottom) (oz.)	16	16	16
Weight of charge (top) (oz.)	12	12	12
Average water infusion pressure per hole (lb./sq. in.)	230	235	230
Stabilized pressure when firing (lb./sq. in.)	375	350	350
Total quantity of water per round (gal.)	9	12	12

The multi-shot pulsed infusion technique, although allowing the firing off the solid in groups, has a considerable number of disadvantages in application. We therefore welcome the final position as it will be presented by the amended Regulations, *i.e.*, in a heading following the seam it will be permissible to use delay-action firing to blast the coal off the solid in one round followed by the stone in one round, provided approved explosives and detonators are used.

When the draft of the new Regulations was studied in July, 1959, due to previous experience with ultra-safe explosives it was felt that a concession was being made on the one hand and taken away on the other, but it has now become evident that the possibility of firing the coal and the rippings even in two separate operations with delay detonators in such headings is at least a step forward, both from the point of view of safety and operational efficiency. In anticipation of the new Regulations, permission for firing in headings where the drivage follows the seam are now quoting the forgoing restrictions. Various trials have been conducted and the results analyzed. In soft conditions, the use of Nobel's explosive 1235 may seem to be a reasonable proposition, but in harder ground the number of additional shotholes and the increased charges give cause to doubt the practicability of this explosive for this particular blasting operation. However, although the strength of the explosive in one instance proved quite inadequate,

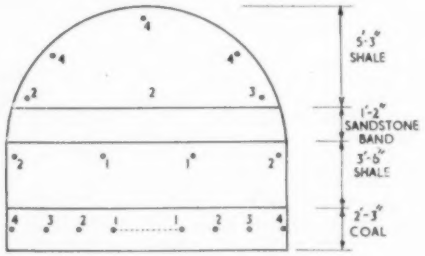


FIG. 6.—DETAILS OF THE DRILLING PATTERN AND THE STRATA IN A 15-FT. BY 12-FT. HEADING AT PENTRECLWYDAU COLLIERY.

there are indications that this technique will be of the utmost value if a somewhat stronger ultra-safe explosive becomes available.

Explosives placed in this category will be required to pass rather more stringent gallery and break tests than normal permitted and eq.s. explosives. The SMRE has not yet been able to finalize all the details of these new tests and we are therefore in the position of having to wait for decisions on a number of important points before the manufacturers can put forward their final compositions for formal test.

These explosives will have to pass a number of tests which truly simulate the most dangerous circumstances under practical conditions. This means that, at this stage, we do not know what the density and strength of the new compositions will be when they are finally approved for colliery use, but it is hoped that the strength of the new material will be such as to make this a really worth while technique.

Trials with New Explosive

Several trials have been carried out using the new explosive and these are summarized as follow:—

Abernant Colliery.—The technique was first tried at this colliery. A 14-ft. heading was being driven across the measures. When coal appeared in the heading HM Inspector of Mines issued a permit for delay firing using Nobel's explosive 1235 and Carrick delay detonators. A Schaffler 350 exploder was prescribed for the firing of the shots. Details of the drilling pattern and the strata in the heading are shown in Fig. 6.

For the first round, holes in the clift were drilled as normal, and to a depth of 5 ft. the charge per hole, normally 24 oz. of Polar Ajax, being increased to 36 oz. The cut was fired by itself and pulled to just over 4 ft. The rest of the holes were then charged and fired. An advance of 3 ft. was achieved and rock projection was abnormal.

In the second round the holes were again drilled as normal and to a depth of 5 ft. The holes were charged again with an average of 36 oz. of Nobel's explosive 1235 and the round fired in one operation. This time, the advance was much worse being 3 ft. 6 in. in the cut area tailing off to 1 ft. 6 in. at the sides. In this case rock projection was again abnormal.

Brynlliw Colliery.—At this colliery a 12-shot exploder had been on trial and, using short-delay detonators and Unigex explosive, excellent results had been obtained. Unfortunately, the 12-shot exploder was withdrawn at the end of the experimental period and the new permission for delay-firing off the solid required the use of ultra-safe explosive, Carrick delay detonators (numbers 1, 2, 3, and 4) and a Schaffler 350 exploder.

The trials were carried out in anthracite coal approximately 4 ft. 6 in. thick with irregular slips. The headings were being driven 16 ft. wide and the coal filled out by a gathering-arm loader. Prior to the test, the pattern of holes shown in Fig. 7 was

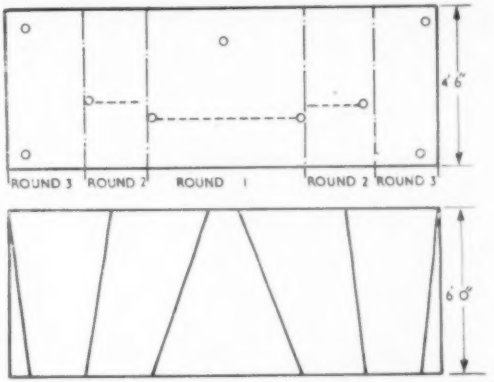


FIG. 7.—ORIGINAL FIRING PATTERN USED AT BRYNLLIW COLLIERY FOR SIMULTANEOUS BLASTING IN SOLID COAL. NINE HOLES WERE CHARGED WITH 13½ LB. OF 1¼-IN. DIA. UNIGEL TO PRODUCE AN ADVANCE OF 6 FT.

being used. The round was fired in three operations and the advance was 6 ft.

Under similar conditions Nobel's explosive 1235 and Carrick delay detonators were used, numerous shothole patterns and charge weights being tried. The pattern shown in Fig. 8, with an increase of three holes, and an increase of 55 per cent. in charge, gave consistent results. Degradation was worse and projection increased. By using 6-ft. drills it was only possible to obtain a pull of between 4 ft. 9 in. and 5 ft. consistently. Comparative costs per round for Unigex and Nobel's explosive 1235 were as follow:—

Unigex.—Nine holes, 1½ lb. each at 1s. 6d./lb.—

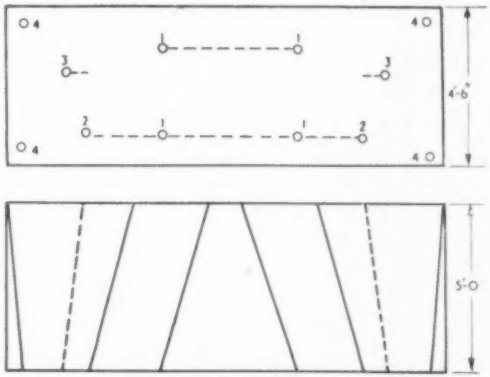


FIG. 8.—REVISED FIRING PATTERN USED AT BRYNLLIW COLLIERY FOR BLASTING A ROUND IN SOLID COAL USING CARRICK DELAY DETONATORS. TWELVE HOLES ARE CHARGED WITH 21 LB. OF NOBEL'S EXPLOSIVE 1235 TO PRODUCE AN ADVANCE OF 4 FT. 9 IN.

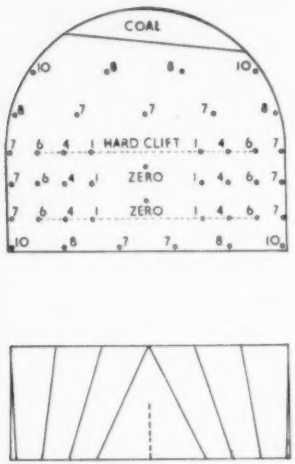


FIG. 9.—FIRING PATTERN AT ABERNANT COLLIERY FOR A ROUND IN HARD CLIFT USING CARRICK DELAY DETONATORS. THE ROUND IS CHARGED WITH 87¼ LB. OF NOBEL'S EXPLOSIVE 1235 TO PRODUCE A PULL OF 3 FT. WITH A SINGLE WEDGE CUT CONSISTING OF TWO STAB HOLES 5 FT. 6 IN. DEEP.

£1 0s. 3d.; nine detonators at 10½d. each—7s. 10½d.; total cost/round—£1 8s. 1½d.

Nobel's explosive 1235.—Twelve holes, 1¾ lb. each at 1s. 10d./lb.—£1 18s. 6d.; 12 detonators at 10½d. each—10s. 6d.; total cost/round—£2 9s.

Fig. 9 shows the firing pattern for a ripping by means of this technique, after the coal had been extracted to a depth of 6 ft. at Abernant Colliery. Exemption had been given for Nobel's explosive 1235 and Carrick delay detonators Nos. 1 to 4 to be fired in a round up to, but not exceeding 25 shots, a Schaffler 350 exploder being used.

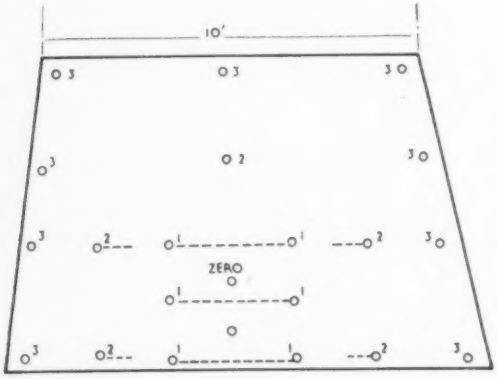


FIG. 10.—PATTERN FOR FIRING A ROUND OF HOLES, CHARGED WITH NOBEL'S EXPLOSIVE 1235, FOR A COAL HEADING AT WYNDHAM COLLIERY. THE TWO STAB HOLES ARE EACH CHARGED WITH 12 OZ., THE SIX CUT HOLES WITH 30 OZ., FOUR MAIN EASERS WITH 36 OZ., AND ALL OTHER HOLES WITH 30 OZ.

The coal had ben removed to a depth of 6 ft. in the first round, each hole being charged with 1¾ lb. of explosive. The round in the ripping was then fired using 2¼ lb. of No. 1235 in each hole. Satisfactory results were obtained both in coal and in ripping.

As a comparison between Nobel's explosive 1235 and Unigel in ripping shots for a 6-ft. advance, the tests showed that 360 oz. or 36 oz./hole of No. 1235, and 240 oz. or 24 oz./hole of Unigel was used.

Permission to fire off the solid was obtained for a coal heading at Wyndham Colliery, using Carrick delay detonators Nos. 0, 1, 2, 3, Nobel's explosive 1235, and a Schaffler 350 exploder. Excellent results have been obtained, rounds of 6 ft. being consistently pulled. Fig. 10 shows the boring and firing pattern.

The technique has recently been introduced at Tirpentwys Colliery in a coal heading 7 ft. 6 in. by 16 ft. Indications are that 6 ft. can consistently be pulled, and that, despite increased charges and an increased number of holes, the fact that the face can be fired in one round makes it really worthwhile.

These trials have indicated that successful results can be obtained firing off the solid with ultra-safe explosive and detonators. The explosive is at the moment, however, too weak to give satisfactory results in hard rock, even with greatly increased charges. We look forward, however, to the development of further compositions of greater strength as these materials are going to be of the utmost value where headings are following the seam.

Stemming

Water ampoules are now extensively used in shotfiring holes in other divisions of the NCB, and they have been the subject of experimental trials in the South-Western Division. The ampoules were of p.v.c. and when used, two ampoules were inserted after the charge into each shothole. Conventional stemming was then used to the mouth of the hole. This introduced just over 1 pint of water into each hole.

Originally it was claimed that they gave a better size of product and had beneficial effects from the point of view of dust suppression; it was on this basis that the tests were made in this division. Trials were carried out in a coal heading at Pentreclwydau, and on longwall faces at Pantyffynnon and Abergorki collieries. It was concluded that, for practical purposes, there was no effect of water ampoules on size of product. The effective dust suppression was what one might expect from the introduction of a pint of water into a shothole.

Further tests were made in a hard ground drivage at Pantyffynnon Colliery after shotfiring, using conventional paper sandbag stemming and water ampoule stemming of the shotholes. Measure-

ments were made of the airborne dust concentrations produced by the shotfiring, and the airborne concentrations of oxides of nitrogen fume.

The ampoules were of p.v.c. and when used two ampoules were inserted after the charge into each shothole. This introduced just over 1 pint of water into each hole.

On all occasions less airborne dust was produced when using the water ampoules and final adjusted calculations gave an overall mean concentration reduction of 45 per cent. of the comparative value when using conventional sandbag stemming. Concentrations of oxides of nitrogen were eliminated compared with a value of 10 parts per million when using sandbag stemming.

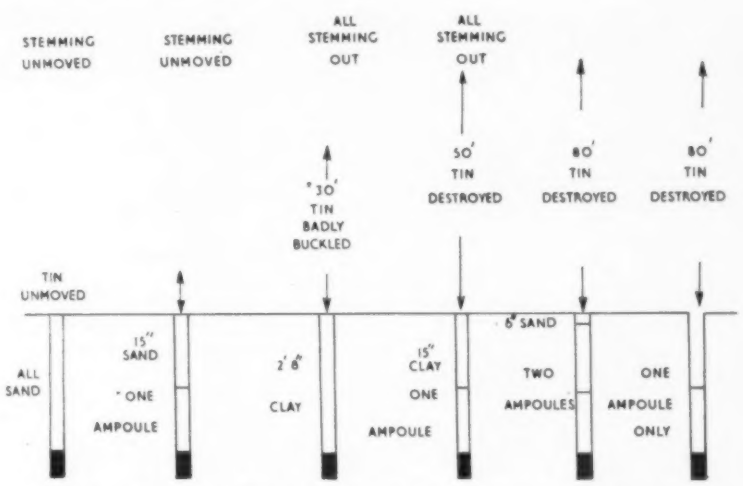


FIG. 11.—DETAILS OF QUARRY STEMMING TRIALS. THE CHARGE WAS 4 OZ. OF POLAR AJAX PER HOLE.

Trials were then carried out in a quarry to determine the effectiveness of water ampoules as a stemming agent. Holes were bored in solid rock, to a depth of 3 ft. 6 in. and a charge of 4 oz. of Polar Ajax used in each. The top of each hole was covered with a biscuit tin. Details of the results are shown in Fig. 11.

It was concluded that under the conditions of firing these test holes, at least 15 in. of dry sand was required for satisfactory stemming, 2 ft. 6 in. of tamped clay was totally unsatisfactory as stemming, and water ampoules alone were totally unsatisfactory as stemming.

The author would like to express his thanks to Mr. G. S. Morgan, production director, South-Western Divisional Coal Board, for permission to present this paper. The views expressed are those of the author and not necessarily those of the board.

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TANGANYIKA'S COAL AND IRON-ORE DEPOSITS

RICH coal and iron deposits have been discovered in Tanganyika, but at sites remote from the coast. Geological indications in the country are, in general, favourable for the presence of exploitable minerals, and a certain amount of mining activity already exists, notably production of diamonds, with a high proportion of gem stones, and of gold. There are prospects for development of phosphate and columbium.

A report of the economic survey mission organized by the World Bank at the request of the Governments of Tanganyika and the United Kingdom recommends acceleration of geological mapping, which has covered to date only about one tenth of the territory. This depends in turn on an acceleration of topographical mapping, which has so far covered in detail less than half of the territory.

The mission also recommends some change in the regulations affecting prospecting by private firms, greater tax incentives to new mining concerns, and the appointment of a full-time resident mining consultant.

The report, "The Economic Development of Tanganyika," is available from the Oxford University Press, Amen House, Warwick Square, London, E.C.4.

A REVISED AND ENLARGED series of data sheets, the 1740 series, on its range of platinum-wound electrical resistance furnaces and control units has been issued by Johnson, Matthey & Company, Limited, 73-83, Hatton Garden, London, E.C.1. Newly introduced is the ash fusion and controlled atmosphere furnace, type K45F. This is primarily intended for the determination of the fusion points of coal and coke ash by the method described in BS 1016:Part 15.

AERIAL VIEW OF THE WORKS OF THE CONSETT IRON COMPANY, LIMITED, CONSETT (CO. DURHAM), WITH THE NEW PLATE MILL IN THE FOREGROUND.

CONSETT IRON'S MODERN 4-HIGH PLATE MILL

Officially Opened by Lord Mills on Wednesday

INSTALLATION of the 132-in. 4-high mill is yet another example of the progressive policy of the Consett Iron Company which can be traced to the forming of the Derwent Iron Company in 1840 to work the local ironstone deposits. Although the local ore deposits were soon exhausted, it proved possible to continue economic iron production because good coking coals were abundant in that area. The company became known as the Consett Iron Company, Limited, in 1864. This was at a time when iron was rapidly giving way to steel and the company soon became a leading steelmaker.

There followed a steady period of expansion right up to the outbreak of the first world war. After the war a bold policy of expansion was pursued; the entire plant was reconstructed and new plate mills were built. The company was thus well prepared for the increased demand for steel that came in the late '30s. The story of Consett developments since the second world war is better known. It will include the first Kaldo steelmaking unit in the UK as well as LD converters.

Present Iron and Steel Production

Production at Consett has long since ceased to depend on home ores. Ore now comes from Sweden, Africa, and America to the Tyne Dock, where special ore-handling facilities have been installed for transferring it to 56-ton hopper wagons for transport by rail to the works.

The ore is crushed, graded, and sintered as necessary and fed with coke and limestone to the blast furnaces, of which there are three. From the blast furnaces molten iron is conveyed in ladles to the steelworks and charged either directly to the open-hearth furnaces as "hot metal" or indirectly via the Bessemer converter as "blown metal" in the Duplex process. The steel is cast into ingots weigh-

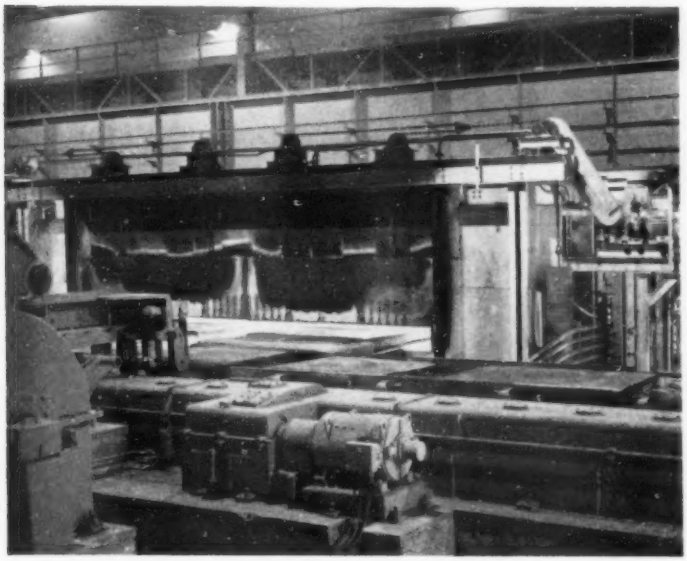


FIG. 1.—SLABS BEING CHARGED INTO ONE OF THE REHEATING FURNACES PRIOR TO ROLLING IN THE NEW 4-HIGH PLATE MILL.

ing from 5 to 25 tons according to the quality and its ultimate use.

Slabbing and Blooming Mill and Continuous Billet Mill

Leaving the steelworks, the ingot is processed in up-to-date plants. In addition to modern gas-fired reheating pits there is a battery of electric soaking pits—another example of the readiness of the company to employ modern methods.

Passing from the reheaters, the ingot is weighed on its way to the slabbing and blooming mill, where it is rolled either into slabs for the plate mill or blooms for the continuous billet mill. A large part of the billet production is processed at the company's Jarrow mill to a variety of smaller sections, including steel strip, angles, flats, rounds, and channels.

Slab Reheating and Descaling

The plate mill, which is the focal point of the new building, is served "fore and aft" by up-to-date equipment. From the slabbing mill installed about five years ago, a slab passes, after inspection and scarfing, if necessary, into one of two reheating furnaces of the continuous type (Fig. 1).

After discharge from the furnace at rolling heat it passes through the descaler box, where water at a pressure of 1,500 lb./sq. in. impinges onto its surfaces, producing an impact force of 10 lb. per in. of slab width, so ensuring efficient removal of scale. The slab then runs forward onto the transfer car on which it is hauled by rope for a distance of 141 ft. before being discharged onto the approach table of the mill, passing thence to the ingoing main table. This transfer car run of 141 ft. is a feature of the provisional planning by the company for the eventual installation of a mill for 160-in. plate.

The New Plate Mill

The new plate mill came into operation in November, 1960, some two years after the difficult task of clearing its site was started. The project included the moving of a colliery waste heap, construction of two new bridges, the laying of seven miles of track, and building of new roads.

By the time the first column of the building went up in May, 1959, nearly 2,000,000 cu. yd. of earth

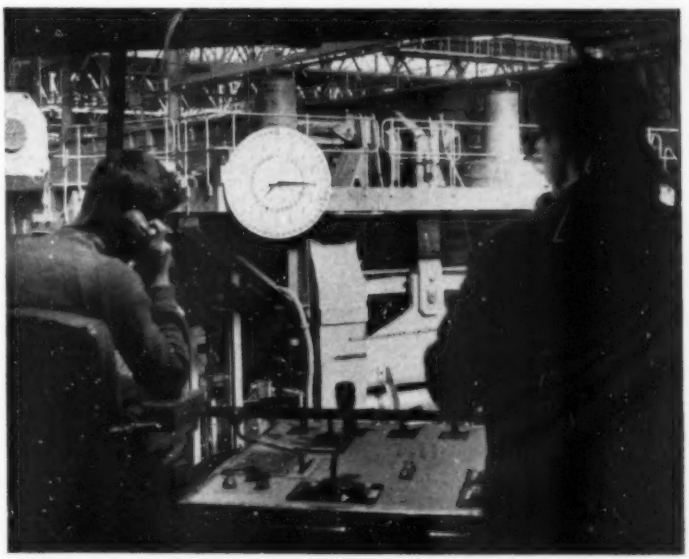


FIG. 2.—THE OPERATORS' EYEVIEW OF THE SEMI-AUTOMATIC SCREW DOWN CONTROL EQUIPMENT AND MILL STAND.

had been moved. The excavation for the mill equipment was also a large task, for example, the mill stand itself has five columns, each of which is sunk 50 ft. deep. The plate mill which is one of the largest in Europe, was designed and engineered by Davy & United Engineering Company, Limited.

Other interesting facts to note at this point are that the vast mill building, which is 2,000 ft. long, 435 ft. wide, and 75 ft. high, required 11,500 tons of structural steel and that the mill housings are two of the largest steel castings ever made in this country, each weighing about 160 tons.

It is pertinent to consider why a 4-high mill has been chosen for plate production at Consett. Stated briefly, it has been chosen to fulfil the more exacting specification now demanded by plate users, particularly by some of the new users. Formerly steel plate was used in shipbuilding and for the manufacture of boilers and tanks, but for very little else and there were few qualities to choose from.

In these days the uses for steel plates are more varied and there is a host of different qualities, each designed for a particular purpose, the number of which is constantly increasing. The requirements of the nuclear engineering industry is a good example. Steel plate for reactor shells has to be easily weldable at low temperatures and yet must stand up to the intense heat generated when the reactor is activated. The new "Bearcomo" steel, which won a gold medal at the Brussels Exhibition in 1959, was developed by Consett for such a purpose.

The advantage of the 4-high principle employed

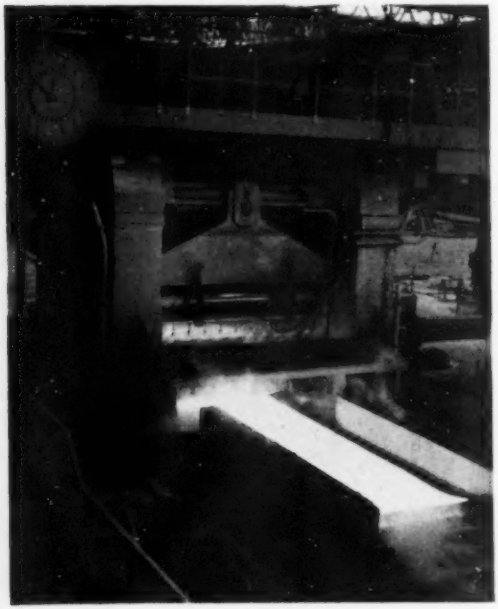


FIG. 3.—A VIEW OF THE NEW 4-HIGH PLATE MILL, SHOWING A PLATE BEING ROLLED.

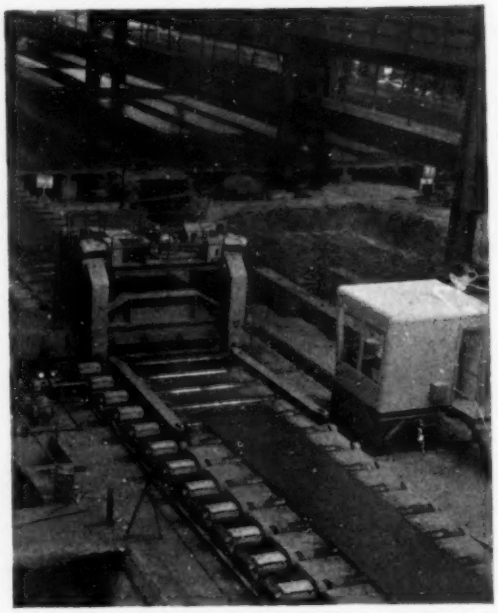


FIG. 4.—VIEW IN THE NEW PLATE MILL BUILDING. IN THE FOREGROUND A PLATE IS APPROACHING THE HOT LEVELLER AND IN THE BACKGROUND PLATES ARE BEING COOLED ON THE COOLING BANKS.

on the new Consett mill is that the mass of the back-up rolls (each 60-in. dia. and 61 tons weight in this mill) supports the work rolls (39-in. dia. in this mill) and enables them to function more efficiently, thus producing rolled plates more speedily and to greater accuracy. The 4-high principle is an essential feature of strip sheet production and just as the user of strip has come to value the high dimensional accuracy and finish available to him, so, too, the user of plate has come to welcome the product of the 4-high plate mill.

The Consett plate mill has rolls of 132 in. width and processes slabs ranging 36 to 60 in. in width, 54 to 120 in. in length, and up to 20 in. in thickness, the maximum rollable slab weight being 25,000 lb. The plates produced will normally range from $\frac{3}{8}$ in. to 4 in. thick, though plates thicker than 4 in. can be rolled by special arrangement. The sheathed widths range up to 120 in. and lengths to 90 in. The rolling capacity of the mill is 10,000 tons per week.

The ingoing and outgoing main tables of the mill have rollers of forged steel driven individually by motors mounted alternately on either side of the table and by reversing the motors at either side broadsiding of a slab can be effected. Adjustable sideguards are fitted to the ingoing and outgoing tables, these being actuated by rack beams via rack and pinion gearing.

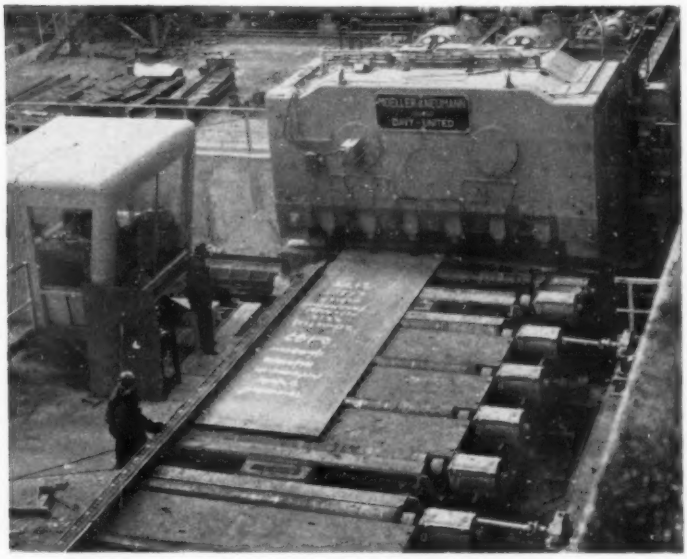


FIG. 5.—A VIEW OF ONE OF THE CROSS-CUT SHEARS IN OPERATION IN THE NEW PLATE MILL. THESE SHEARS ARE CAPABLE OF CUTTING PLATES UP TO 1½ IN. THICK.

MILL DRIVE.—Two 5,180-h.p. 45/80-r.p.m. motors drive the mill through universal spindles and couplings. These provide a mill speed of 460/816 ft./min. Hydraulic balancing is provided at the mill end of the top and bottom spindles and spring balancing at the motor end. The oil-injection method of mounting is used on the jaw ends of the top and bottom spindles and on the motor end couplings.

To enable quick and simultaneous changing of the work and back-up rolls an electrically driven rack-type rig is provided.

SEMI-AUTOMATIC SCREW DOWN GEAR.—The operator is able to preset the screws by use of a system of semi-automatic positioning controls provided for the screw down gear. Two 200/520-h.p. 420/1,000-r.p.m. motors allow separate screw adjustment at speeds ranging from 30 to 72 in./min. Over-running of the screws is prevented by limit switchgear and indication of screw down in the control pulpit is provided by "Selsyn" equipment, there being a conventional dial-type indicator on the mill.

Slab entry into the work rolls is facilitated by three feed rollers at both the ingoing and outgoing sides of the mill. These rotate in roller bearings in the housing posts and each has independent motor drives.

To ensure complete freedom from scale before the slab or plate passes to the rolls high-pressure, water-descaling headers operate on each side of the mill.

Plate Levelling and Shearing

Plate up to 1½ in. thick is roller levelled immediately on leaving the 132-in. mill (Fig. 4). This is done by passage, at speeds up to 50 ft./min. for plate up to ¾ in. thick and at 100 ft./min. for thicker plate, through a 138-in. wide, 9-roll backed-up leveller. The plate is then transferred to a cooling bed of the machined cast-iron grid type; and after traversing this is turned automatically for inspection and passed to the first cross-cut shear for cutting to marked sizes. This cross-cut shear is of the "rocking blade" type and ensures clean edges, minimum bow in the plate, better shaped plates, and less strain hardening in the body of the plate itself (Fig. 5).

These rocking blade shears, designed by Moeller & Neumann, of Germany, were supplied by the

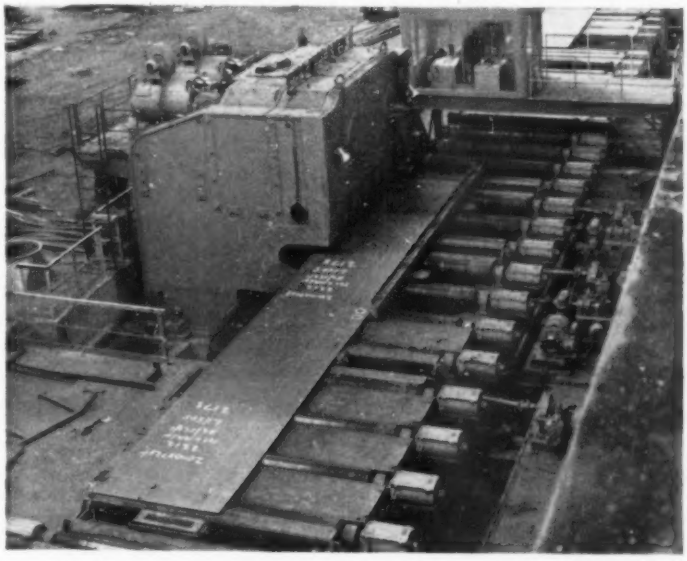


FIG. 6.—A VIEW OF ONE OF THE SIDE-CUT SHEARS IN OPERATION IN THE NEW MILL. THESE SHEARS ARE CAPABLE OF CUTTING PLATES UP TO 1½ IN. THICK.

Three Development Plans

SINCE the last war the Consett Iron Company, Limited, Consett (Co. Durham), has completed two large development plans, which have more than doubled the ingot production by bringing it to 1,000,000 tons by 1957. This was achieved by building an ore-handling plant, a blast furnace and coke-oven plant, a power station, a slabbing and blooming mill, and a continuous billet mill.

On Wednesday, Lord Mills, the Paymaster General, officially opened a modern 132-in. 4-high plate mill, the new mill representing the major part of the third development plan, which, by 1965, will nearly double the company's present steel output. The new mill has raised plate-making capacity to 10,000 tons a week—500,000 tons a year.

Davy & United Engineering Company, Limited, which has an exclusive agreement for their manufacture in Great Britain. After this first cross-cut shear, plates of up to 1½ in. thick pass to the heavy shear line for cutting to size and plates of ⅜ in. to ¼ in. pass to the light shear line.

The heavy shear line has two side-trimming shears of the rocking blade type (Fig. 6). The first of these cuts the right-hand edge of the plate and the second one, sited 94 ft. further along the roller table, trims the other edge. The trimmed plates are then cut to required lengths on a rocking blade cross-cut shear.

The light shearing line trims both edges of the plate simultaneously by a rotary side-trimming shear having two pairs of forged alloy steel circular cutters. As in the heavy shear line, the plate then passes to cross-cut shears of the rocking blade type for final cutting.

This light shear line also provides for cold-plate roller levelling in an 11-roll machine of the backed-up type.

Finishing Services

CHEQUER FINISH.—A chequer pattern finish is provided as required on plates up to 1 in. thick by transferring plate from the 132-in. mill to a 24-in. and 42-in. by 84-in. 4-high chequer plate mill which will roll at speeds up to 350 ft./min. The chequered plate is levelled in a 9-ft. 6-in. hot leveller and then rejoins the line for cooling, inspection, and shearing.

NORMALIZING, QUENCHING, AND TEMPERING.—To meet the growing demand for plate in alloy steels and in special heat-treated condition facilities for normalizing, quenching, and tempering plate have been included in the new plate mill project. These facilities have been laid out so that plates can be routed back to the shearing lines for shearing if required and for cutting out test pieces.

The equipment consists of a Priest continuous normalizing furnace, three Gibbons batch-type furnaces (two normalizing and one tempering), and a pressure quenching line which follows immediately after the continuous normalizing furnace.

Briefly, in the finishing section the processing procedure is firstly normalizing by heating the plate to a temperature of 900 to 950 deg. C. then, if quenching and tempering are required, the hot normalized plate is immediately clamped between two hydraulically operated platens and held firmly while sprayed with water at high pressure to cool it rapidly to 250 deg. C. The quenched plate is subsequently tempered in a batch furnace operating in the temperature range of 550 to 770 deg. C. with controls to keep the temperature within plus or minus 3 deg. of the desired temperature.

Shotblasting

To provide plate with a perfectly scale-free surface modern equipment for the process of shot blasting has been installed. This equipment can deal readily with finished plates from the heavy or light shearing lines and the heat-treatment section.

Mechanical devices raise the plate into the vertical position and propel it into the shotblast chamber. As it passes through the chamber it is shotblasted simultaneously on both sides. The process can be operated continuously by the plates passing in front of the shot impellers without gaps between them. The plates are run out from the chamber and then lowered to the horizontal position.

Provision has been made for the subsequent installation of equipment for painting and drying plates in the line between shotblasting and lowering to the horizontal.

The shotblaster, which operates semi-automatically, is a Spencer & Halstead "Centriblast," designed for descaling plates up to 12 ft.

Big Shotblasting Chamber in Sheffield

BIGGEST hirework shotblasting chamber in Sheffield which has been under construction for the past six months, has now been completed and brought into operation by the Darnall Shotblasting Company, Limited.

The steel-walled chamber, which is 32 ft. long by 12 ft. wide and 12 ft. high and has a 20 ft. square extension, is also among the largest in the country.

The very large blasting chamber has been installed, says Mr. Peter Wharton, chairman and managing director of the company, because Sheffield is producing bigger and bigger fabrications and more and more do engineers want to have fabrications cleaned before they are painted with protective coatings.

THE NEW WORKS OF CRAWLEY INDUSTRIAL PRODUCTS, LIMITED, AT LLANELLY.

MINING MACHINERY MAKERS' NEW WORKS

Crawley Industrial Products at Llanelly

Specialists in providing machinery for thin-seam mining, Crawley Industrial Products, Limited, a member of the Ayling group, officially completed the move to its new factory at Llanelly on Wednesday after operating from Croydon (Surrey) for several years. The new factory, which was opened by Mr. Niall Macpherson, Parliamentary Secretary to the Board of Trade, will provide employment for some of the workers made redundant by the closure of small and uneconomic tinplate works.

FOR some time prior to 1959 it was realized by the Board of Trade that some labour in Llanelly would be redundant, and industrialists with a reasonably large requirement of male labour were invited to move to the west Wales area. Crawley Industrial Products, Limited, being anxious to expand, indicated its willingness to settle in the area.

Llanelly had a considerabe pool of male labour available and the town suggested a site on the old "Town Dock," which had been filled in some 60 years before. The Board of Trade agreed to finance the project, and the Industrial Estates Management Corporation for Wales was asked to erect the works under the usual terms of a leased factory.

The site was an open one, quite level, bounded on the north by the main railway line from Swansea to the west, and on the south by sand dunes adjoining the sea. Railway access required by the company was therefore fairly simple to obtain. Road access to the site was not very good, but the local authority agreed to construct a new road leading to the site.

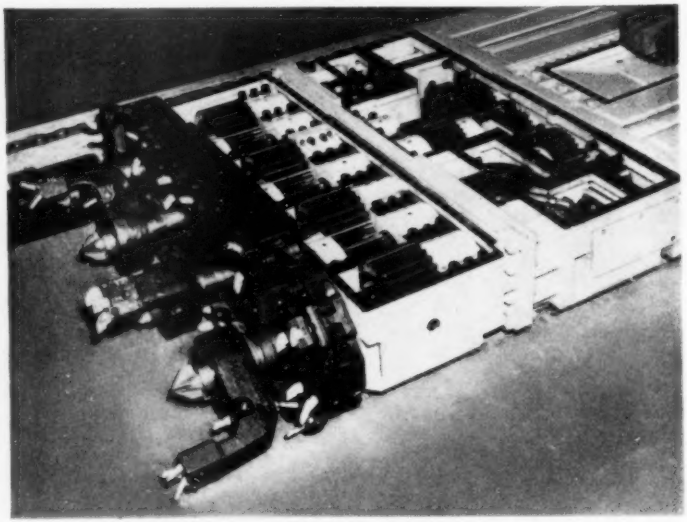
A fairly extensive office block was required to include a large drawing office, and two storeys were necessary to contain all the requirements. Precautions were taken to avoid noise from the factory disturbing the offices by using separate steel stanchions and an 11-in. cavity brick wall, the cavity being filled with glass wool.

The crane rail in the factory adjoining the offices was mounted on rubber blocks to reduce noise from this source.

The canteen was sited as a separate unit adjoining the entrance so that it could be used for social functions without access to the factory being required.

The production space was occupied at the beginning of August, 1960, after only some nine months' work, and the whole contract was handed over on February 23 of this year, a total contract period of 14 months. The layout is designed to facilitate the completion of a second stage of development in due course.

Working seams with thicknesses of less than 3 ft. presents special problems. Unless mechanized coal cutting and loading are applied many collieries will be faced with closure, because otherwise they would be completely uneconomic in operation.



THE CRAWLEY MIDGET MINER WITH TOP PLATE REMOVED.

It is interesting to study the trend of development of Crawley Industrial Products in this light, because from its inception, the chairman, Mr. F. H. Ayling, and the general manager, Mr. Norman Dixon, focused their attention upon this difficult problem of thin-seam mining.

First the company introduced the heavy-duty armoured snaking conveyor, and as the trend towards prop-free-front mining required a narrower and lower conveyor, Crawley developed the Lo-Hite conveyor. Next came a mobile stage loader providing a vital link between the face and gate belt conveyors which made it unnecessary to introduce extensions in short lengths to the gate belt. After a stage loader giving up to 12-yd. belt coverage from the gate belt had been designed, there were requests for equipment to meet special conditions, and a mobile stage feeder-loader which had a belt coverage of up to 75 yd. was completed.

Still further demands confronted the company. One set of conditions required minimum of belt coverage with the possibility of even longer extensions and then emerged the extensible stage loader with a minimum length of 12 yd. and a maximum length of 150 yd. The next new development was the tub feeder type of stage loader to take the coal from the face directly to a loading point where tubs could be switched and handled. The machine had a much higher capacity in tons per hour than the average handling capacity of the face conveyor, so that it was able to deal with output peaks. Then it became apparent that the existing distribution system could not deal with the output peaks, giving rise to time wastage of the power-loading machinery at the coal face. The Crawley bunker conveyor provided for adequate bunkerage, so that continuous working at the coal face could take place despite delays on the transportation system.

Then it emerged that some power-loading systems tended to produce excessive large coal which damaged the trunk belts and caused excessive spillage in the gateways. Crawleys approached British Jeffery-Diamond, Limited, which had designed a coal breaker unit, with a view to incorporating it in the standard Crawley stage loader. This guaranteed that nothing larger than 8-in. coal would arrive on the gate belt, which minimized belt damage, reduced spillage, and increased the overall capacity of the gate belt.

Later, the company designed and produced the Midget Miner, which successfully power loads on to either an armoured snaking conveyor or a bottom-loading belt for thin seams, following it with the Crawley Wilcox continuous miner. A sensing device developed by the NCB has now been applied to the Midget Miner—a considerable step forward towards the application of automatic control in coal-cutting machines.

NEW ZEALAND REPORTS state that the country has proved a disappointment to the prospector. Most minerals of economic importance have been discovered, but, with a few exceptions, not in commercial quantities. Prospects for developing the large quantities of iron sands are better, and investigations are proceeding to define ocurrences of high-purity limestone for use in calcium carbide manufacture.

JAPANESE COAL INTERESTS have offered an unacceptable price for the renewal of the contract for coal from New Zealand, according to the Minister of Mines, Mr. Shand. The present contract price is 87s. a ton, f.o.b., stowed and untrimmed, but for the renewal due shortly the Japanese are offering a price of 69s. 3d. The Minister said that to do business at the new price would mean a subsidy and the laying of New Zealand open to accusations of dumping.

There is available a variety of injections that can be made at tuyere level and elsewhere to increase the effectiveness of blast-furnace performance. Experiments of the kind are both lengthy and costly. However, theoretical considerations and simple calculations based on reasonable assumptions provide a means of selecting several methods worth consideration. Some of these were discussed by J. A. Cordier, head of the Blast-furnace Research Section, IRSID, St. Germain-en-Laye, France, in a paper presented at the 43rd Conference of the AIME Blast Furnace, Coke Oven and Raw Materials Committee. A summary of the paper is given below.*

BLAST-FURNACE INJECTIONS

Methods Worth Consideration

IN testing the injection of different materials, it should be kept in mind that blast-furnace techniques and designs have been perfected over many years, and one should not greatly alter the working conditions of existing, modern furnaces. The main conditions to be met are the following:—

(1) The thermal gradient in the stack should be maintained, the heat capacity of the upgoing gases being approximately equal to that of the downcoming solids, as in any heat exchanger. This factor explains the advantages of lightening the burden by beneficiation and sintering. Fuel oil injected at the tuyeres also lightens the burden by reducing the quantity of coke charged itself and represents a substantial saving. If the gas volume is too large, the temperature gradient is shifted upward, resulting in a hot top. But if the gas volume is too small, the stack becomes cold, iron oxides do not have a chance to be reduced before they melt, and the quality of the iron falls.

(2) The temperature of the combustion zone in front of the tuyeres should be closely controlled. Behind the wall of coke, where most of the molten materials flow, very hot reducing gases (2,000 deg. C.) heat up coke, slag, and iron to high temperatures which speed up the reaction:

$$(SiO_2) + C = CO + SiO \text{ (gas)}.$$

The silica comes from coke ash and slag; hence the difficulty of obtaining low-silicon iron and high blast-temperatures with high-ash coke or acid slags. The SiO can react with iron or primary (oxidized) slags by two mechanisms:

$$2\,(SiO)\text{ gas} = Si\text{ in iron} + (SiO_2)\text{ slag}$$
$$(SiO)\text{ gas} + (FeO)\text{ slag} = Fe + (SiO_2)\text{ slag}.$$

Through these two mechanisms, there is a tendency for SiO_2 to be retained in the bosh, much in the same way as ZnO is retained in the furnace at a higher level.

Dissolved in the primary slags, silica thickens them, and the paste makes a roof which protects the raceway. In normal circumstances, this roof collapses at regular intervals, but if there is too much SiO, the SiO_2 builds up in the lower part of the bosh and clogs the furnace, the charge does not descend regularly, the furnace kicks, and the blast pressure increases. This situation can aggrevate itself to the point of serious hanging.

The well-known remedy is to cool the combustion zone with a colder blast or water vapour. The quality of coke and burden can have a great influence on the temperature, and injections into the blast also can provide the necessary control.

(3) It is desirable to perform in the stack as much indirect reduction as is compatible with the reducibility of the ore and sinter. With lean burdens, there is always an excess of reducing gases in the stack because much coke is needed to satisfy the thermal needs of the charge. This is not always so with very rich burdens where indirect reduction can be limited by the small amount of reducing gas per ton of iron oxides. Thus, it should be worthwhile improving the reducibility of lean sinters and increasing the quantity of reducing gases for very rich burdens. This can be done by the injection of hydrocarbons, compensated by super-heating the blast or even by oxygen enrichment, if this proves economical.

Role of Stoves and Gases

The hot-blast stoves have a high thermal efficiency burning blast-furnace gas, its heat being extracted and transferred at approximately 800 deg. C. to the hot blast. By combustion with preheated coke, this same heat is boosted to about 2,000 deg. C. and transferred to a reducing gas. This excellent heat pump ensures the success of the blast furnace over the electric arc in melting at high temperatures under reducing conditions. Since the stoves perform such a beneficial role they should be operated to produce the highest possible blast temperature.

Nitrogen is necessary to transport heat from the stoves to solids in the stack. For lean burdens,

* From Journal of Metals, January, 1961.

there is insufficient nitrogen in the air to perform this task. But for rich burdens, there is excess nitrogen, and oxygen enrichment of air would be worthwhile.

Carbon monoxide is plentiful when operating on lean burdens and not very well utilized, valuable coke being burned to make it. Carbon monoxide is a good reducing agent at low temperatures, but it is inefficient at high temperatures where reactions with solids could proceed rapidly. In the bosh, carbon monoxide slows down the solution loss, but —triggered by the presence of reduced iron and hydrogen—it sustains carbon deposition in the temperature range of 430 to 700 deg. C. Very fine carbon, however, can be harmful, and the formation of carbon black from injected fuel oils and other hydrocarbons should be avoided. On the other hand, the formation of carbon black seems less harmful than deposited carbon.

Normally, hydrogen represents a small percentage of the gases in the blast furnace; it comes from the blast moisture, volatiles in the coke, and hydrates in large pieces of ore or fines. Hydrogen also can be injected as water vapour or hydrocarbons in the blast. It is an excellent reducing agent, especially at high temperatures where it can compete with the coke carbon. Due to its high diffusivity coefficient, hydrogen reaches the centre of ore particles through minute microporosity faster than any other gases; thus, it precedes the carbon monoxide reduction front. The resulting H_2O diffuses back faster than CO_2 and transfers oxygen to CO at the surface.

The heat conductibility of hydrogen is from seven to 10 times greater than that of other gases; thus, it accelerates the heat exchange between gases and solids, and narrows their temperature difference, thereby reducing the heat losses through the top gas. In the combustion zone, hydrogen helps in the heat transfer by means of active convection, *i.e.*, the formation of free radicals—still not very well understood—which recombine at the surface of a solid to delivery very efficiently the energy absorbed at high temperatures.

This phenomenon has not been taken into account in the calculations; thus, the injection of hydrogen in one form or another, should permit the blast temperature to be increased to a higher level than has been calculated. This was observed for steam injections—from the theoretical 24.7 to 37 deg. F. per extra grain per cu. ft.—but, unfortunately, it was not observed for fuel oil and natural-gas injections.

Injection Principles

The role of gases in the blast furnace and the most efficient utilization of stoves, in addition to factors cited for the maintenance of blast-furnace working conditions, form the basic principles which IRSID used to find the correct and most economic conditions for the injection of materials into the blast. They can be summarized as follow:—

(1) The thermal gradient of the furnace should be maintained, and especially the temperature of the combustion zone; (2) the volume of the reducing gases should be adjusted to the needs of the indirect reduction of oxides; (3) the blast should always be at maximum temperature; (4) formation of carbon black should be avoided; (5) it is always worthwhile to replace CO by H_2; (6) with rich sinters it is worthwhile to replace N_2 by CO or H_2; (7) with lean, but reducible sinters, it is worthwhile trying to replace part of the CO by N_2 at a low driving rate.

Effects of Regularity

The moisture content of the air can vary considerably. For the blast, it is should be controlled, because a fluctuation of 1 gn./cu. ft. must be compensated by a change of blast temperature of at least 25 deg. F. to keep the combustion zone at the same temperature, and 35 deg. F. to keep the furnace hot when the change in moisture is to be permanent.

Blast moisture can be controlled by drying the air—quite expensive—or by injecting steam into the cold blast. Since steam is an expensive source of hydrogen and oxygen, it should be kept at the lowest possible level in the blast, and replaced, if necessary, by some hydrocarbon injected in the tuyeres. A means of keeping moisture at a minimum and controlled level is by washing the compressed air in a cooling tower with cold water. If the blast is at 15 lb./sq. in. and the water at 60 $\pm$10 deg. F. the moisture will be 3 $\pm$ 1 gn./cu. ft.

The effects of other uncontrolled fluctuations may have to be corrected. A change of the coke charge takes 10 hr. to be effective and 6 hr. with the ore, but a change in the blast temperature is effective immediately. While such a correction is quite applicable to small fluctuations, it is dangerous for larger changes, because the temperature of the combustion zone is dependent upon the temperature of the blast, and large increases in temperature of the combustion zone can provoke sticking and hanging. One solution to this problem is the following procedure:—

If the furnace is cold, the blast temperature can be increased, and nitrogen injected into the cold blast at the rate of 4.47 per cent. of the air volume per 100 deg. F. The total heat input per ton of coke burned at the tuyeres is double the value without nitrogen. The thermal gradient in the furnace is unaffected. When blowing at constant pressure or pressure drop, less coke is burned, and the furnace slows down, which helps to warm it up.

When making injections steadily into the blast, it is an easy matter to control immediately small fluctuations of the furnace without altering the blast temperature, which should be maintained at a maximum. This control can be accomplished by adjusting the quantity of material injected. However, if the fluctuations are large, nitrogen should be injected until coke correction is effective.

The production of a blast furnace can be referred to as P ton/day/1,000 cu. ft. of working volume. This term has a physical meaning when the gases are reasonably distributed over the cross-section of

the furnace. When the driving rate is increased, the coke rate rises slowly, because there is a reserve zone in the stack where exchanges of heat and oxygen between gases and solids come to a stop. Thus, if there is too much furnace volume per ton of iron, the driving rate is too slow. If the furnace is blown very hard, there is no reserve zone left, and indirect reduction is curtailed, causing a sharp increase in the coke rate. A partial fluidization of the solid bed occurs; the gases pass up the chimney in large quantities without meeting any solids and the coke rate and the quality of the iron are disastrously poor. A good working furnace should be operated just below this state. When the commercial situation requires more iron, one solution is to beneficiate the burden or charge scrap.

Reasons for Production Increases

Injections enable production, limited by stack reactions, to be increased for the following reasons:—

(1) Some of the coke is replaced by another fuel injected at the tuyeres. The weight of this coke can be replaced in the charge by a thermally equivalent weight of ore which will not change the retention time of solids or gases.

(2) If the material injected into the furnace is hydrogen-bearing, or increases the $CO + H_2$ percentage in the combustion gases, the kinetics of reduction and heat transfer will be enhanced, and it will be possible to drive the furnace faster, while keeping the same performance. Different materials can be ranked in terms of the percentage of extra hydrogen, h, that they introduce into furnace gases. For superheating the blast by 80 deg. C., the percentage of h is equal to: 3.8 for cold hydrogen; 2.35 for cold coke-oven gas; 2.15 for natural gas; 2.0 for fuel oil atomized with coke-oven gas; 1.75 for fuel oil atomized with compressed air; 1.35 for high-volatile coal, and 1.30 for steam. It can readily be seen that steam is not a good source of hydrogen; coke-oven gas or natural gas is preferable.

If the presence of hydrogen improves blast-furnace operations by increased indirect reduction, lower heat losses in top gas, and better heat transfer in the bosh, then the overall heat and reducing-gas requirements per ton of iron can be lessened considerably.

If we assume that the weight of burden plus coke is constant, we imply that heat requirements are constant per unit of weight. If this is not the case, then we should keep constant the retention time of the gases, or if the void index of the burden is the same, the gas production of the furnace should be kept constant. And if the total heat balance of the furnace per ton of iron has dropped by a given percentage of H_2, then one can increase production by a similar percentage.

Experience with fuel oil and natural gas has shown that it is economical to work at constant coke consumption. If it is necessary to go beyond the limit of the stoves, oxygen enrichment of the blast and a further increase in the quantity of material injected, could be used.

The IRSID conclusions are valid for overblown furnaces, for their characteristics can be returned to normal with more air blown or by applying high top-pressure techniques. With fuel or gas injections it should be possible to obtain the same production as before, but with a good coke rate and a smoothly operating furnace.

Hydrocarbon injections are complementary to high top-pressure techniques. They can be combined to obtain really high production rates with good coke rates and good quality iron which never could be reached with injections alone, because beyond a certain point, there is fluidization of the charge which only high top-pressure can check. In addition to fluidization, there is another phenomenon which can limit the production rate, especially with sinters containing less than 50 per cent. Fe; it is the reducibility of the oxides.

Charging hot sinter can increase considerably the production rate of furnaces receiving injections because it makes good use of the reducing gases injected. It also has the following advantages:—

(1) The carbon deposition reaction cannot take place because the iron oxides, which catalyze the reaction at about 540 deg. C., are too hot; this avoids many problems, especially with hydrocarbon injections, since the presence of hydrogen strongly accelerates carbon deposition. The reactions in question can be written (in the order of increasing speed):

$$CO + CO \rightarrow CO_2 + C$$
$$2CO + CaO \rightarrow CaCO_3 + C$$
$$CO + H_2 \rightarrow C + H_2O$$

(2) With high top-pressure and self-fluxing sinter, the free CaO and the calcium ferrites can react with CO_2 between 540 and 870 deg. C. according to the following reactions:

$$CO_2 + CaO = CaCO_3$$
$$CO_2 + CaOFe_2O_3 = CaCO_3 + Fe_2O_3$$
$$CO + CaOFe_2O_3 = CaCO_3 + 2FeO$$

The carbonate, thus formed, is dissociated at approximately 900 deg. C. (and up to about 980 deg. C. according to the pressure) in a lower part of the furnace. There is an accumulation of carbon dioxide between the 540 and 910 deg. C. isotherms, both in the solids going down and the ascending gases. This carbon dioxide poisons the gas, burns some carbon of the coke, and takes up useful heat at about 900 deg. C. to deliver it at 540 deg. C. where it is wasted. There is good practical evidence of this phenomena, which can be avoided by charging hot sinter.

(3) The rapid and abrupt cooling of the sinter, even in large air coolers, stresses the glassy material which binds the crystals and makes it more fragile. Hot sinter being pasty does not make as much fines.

Slow Driving Rate

During periods when pig-iron is in slack demand, it may be interesting to put furnaces on reduced blast. The injection of nitrogen into the cold blast can be very useful in such circumstances, provided nitrogen is available at a reasonable price.

At low driving rates, the gases and solids remain

in the furnace much longer, and they are almost in equilibrium with the charge. The quantity of reducing gases per ton of iron can be reduced without affecting indirect reduction, and it is possible to inject nitrogen into the cold blast and raise the blast temperature or replace hydrocarbons at the tuyeres with nitrogen in the cold blast.

TABLE 1.—*Variation of Blast-furnace Driving Rate by Injections.*

	Slow.	Ref'nce.	Normal.	Fast.	Accelerated.
Material injected ..	N/2	—	Fuel	Fuel	Fuel + O_2
Blast temperature, deg. C.	1,020	800	1,020	1,020	800
O_2 in blast, per cent.	17	21	21	21	27
N_2 or O_2, cu. ft./ton hot metal	11,500	0	0	0	5,100
Fuel, lb./ton hot metal	0	0	154	172	310
Coke, lb./ton hot metal	1,210	1,540	1,080	1,270	1,400
Coke saving, lb./ton hot metal	330	—	460	270	140
Coke, per cent. ..	21.5	—	30.0	17.5	18.2
Top temperature, deg. C.	150	204	150	204	250
CO_2/CO	0.625	0.365	0.610	0.354	0.268
Indirect reduction, per cent.	73	65	80	65	65
Top gas, Btu/cu. ft.	71.5	99	81.5	106	135
Top gas, Btu × 10^6/ ton hot metal ..	6.2	9.4	6.95	9.7	12.9

An example of the adapatation of the blowing and fuel conditions to production requirements has been calculated and is shown in Table 1. This table refers to a burden of 100 per cent. self-fluxing sinter, made of crushed Minette ore of 37 per cent. Fe. The percentage analysis of the hot metal is as follows: C, 3.5; Si, 0.5; Mn, 0.4, and P, 1.9.

Effect of Coke Rate

Carbon charged into the furnace, per ton of iron, is distributed as follows:—In the hot metal, 70 lb.; in reduction of SiO_2, MnO, P_2O_5, and FeS, 30 to 70 lb.; in flue dust, 10 to 40 lb.

The remainder is burned, either by

CO_2 or H_2O in solution loss	d_1 lb.	D lb.
FeO in direct reduction	d_2 lb.	
the blast at the tuyeres		T lb.

Thus, to the reduction in coke rate, there are the following possibilities:—(1) Replace part of carbon, T, with some other fuel at the tuyeres; (2) decrease D, *i.e.*, improve indirect reduction, or (3) lower T by reducing the thermal requirements per ton of hot metal.

(1) *Substitution of Another Fuel for Coke at the Tuyeres.*—The temperature of the combustion zone should remain constant, and this factor can be used to write a quantitative relation between the amount of material to be injected per unit volume of blast and the superheating or oxygen enrichment of the blast necessary to compensate for the cooling effect of the injection.

These calculations consist of making a material and heat balance of the combustion zone for the reference period and for the injection period, assuming that the temperature of the combustion gases (CO, H_2, and N^2) are the same in both conditions. The material balance is referred to 1,000 B.t.u. transported as sensible heat by the gases. The overall calculation of the benefits to be derived from the injection can be made by assuming that the thermal requirements of the charge have not been changed.

Materials injected can be ranked in the order of their replacement value for coke. For 1 lb. of coke, it takes (with superheated blast):—1.11 lb. of coal, 0.775 lb. of fuel oil; 15.2 cu. ft. of CH_4; 20.8 cu. ft. of rest gas; 37.7 cu. ft. of coke-oven gas, and 77 cu. ft. of H_2.

With oxygen enrichment of the blast, the results are rather poor for this aspect of the question, because the blast, containing less nitrogen, brings less heat from the stoves per unit of carbon burned at the tuyeres. Thus, there is a deficit which must be compensated by burning more fuel.

(2) *Improve Indirect Reduction.*—The weight of carbon, D, burned by direct reduction and solution loss can be reduced by proper injections. If the sinter is poor in iron, there is plenty of carbon monoxide, but it may not be well utilized because lean sinter is not readily reducible. Hydrogen, as mentioned previously, catalyzes the reducing reactions. At high temperatures, it also performs reduction on molten primary slags which carbon monoxide would have left to coke carbon. Both phenomena improve the indirect reduction and lessen the weight of carbon, D.

Different tests, especially thorough stack investigations by E. P. Bonnaure at the International Low Shaft Blast Furnace at Liège, Belgium, under varied conditions have shown that 35 to 50 per cent. of the injected hydrogen was used to improve the indirect reduction, most of the values centring around 40 per cent.

It can be calculated that, for an increase of 1 per cent. H_2 in the combustion gases, the indirect reduction coefficient (and D) is improved by 3 per cent. with a 100 per cent. self-fluxing sinter burden and by 4.5 per cent. with a 100 per cent. unprepared burden. It is, thus, worthwhile injecting high-hydrogen materials into blast furnaces where the top gases are of high B.t.u. content and the indirect reduction coefficient low. Coke-oven gas is well suited, and steam gives the smallest increase of hydrogen in the combustion gases.

If the sinter is very high in iron, it may be that, even though the top gases are low in B.t.u. content, the indirect reduction coefficient is low because there is not enough reducing gas to satisfy the needs of the reducible sinter. In this case, combustion gases should be enriched in carbon monoxide and hydrogen, even with oxygen enrichment of the blast, if this proves to be economical. Table 2 compares different materials in this respect; it gives the percentage ($CO + H_2$) in the combusion gases

TABLE 2.—*Percentage CO + H_2 in Combustion Gases According to Material Injected (Reference 36.2 per cent.).*

Material injected.	H_2	H_2O	Coke-oven gas.	CH_4	Fuel oil.
Blast temperature + 200 deg. C. ..	42	40.1	40.1	39.4	39.0
Oxygen at 27 per cent.	—	50.9	49.5	48.7	48.0

obtained when superheating the blast to about 200 deg. C. or an oxygen enrichment of 6 per cent.

(3) *Decrease Thermal Requirements per Ton of Hot Metal.*—The most efficient way of reducing the coke rate is to reduce heat requirements per ton of hot metal, since they account for about 80 per cent. of the coke consumption. Improvement of the indirect reduction coefficient can reduce considerably the heat requirements per ton of hot metal. Hydrogen can also be a factor in reduced thermal requirements, since its injection improves heat transfer and promotes increased production which lowers heat losses and, as a consequence, the coke rate.

Calculations

When making calculations, operating conditions of the blast furnace are first analysed. Material and heat balances are then worked out for the combustion zone and the rest of the furnace. The conditions at the tuyeres referred to 1,000 B.t.u. are then calculated for several materials likely to give good results and for the maximum superheating of the blast possible with the stoves. Oxygen enrichment can also be considered. The new top temperature, indirect reduction coefficient, and heat losses are estimated from the anticipated working conditions of the furnace, past experiences with injections, and the analysis of the combustion gases in H_2 and $(CO + H_2)$. Several estimates can be used to judge which one is the most realistic.

The heat and material balance is calculated for the new conditions. From the total heat requirements and the conditions at the tuyeres per 1,000 B.t.u., it is possible to calculate the blast volume and the total quantity of material to be injected. And, with the indirect reduction coefficient and the analysis of the oxides, the top gas volume and composition are computed.

Many sets of calculations were made, the general conclusions being as follow:—

(1) If coke is expensive, materials with high $C:H_2$ ratios should be injected with very high blast-temperatures, the driving rate being kept normal.

(2) If a high production rate is required, materials with high $H_2:C$ ratios should be injected with high blast temperatures and even with oxygen enrichment if necessary.

(3) With very rich sinter burdens, oxygen enrichment and injection of high $C:H_2$ materials should be worth while, provided the price of oxygen is not too high. If this is not the case, H_2O, CO_2, or a high $H_2:C$ material could be injected with an increase in the blast temperature.

(4) With lean sinter burdens, at slow driving rates, the injection of nitrogen in the cold blast can be economical, if nitrogen is available at very low cost.

Technological Difficulties

The injection of steam, carbon dioxide, flue gases, nitrogen, and oxygen into the cold blast is no problem; but the injection of reducing materials presents difficulties. A proposed solution is to introduce the material as far as possible into the tuyeres so as to prevent premature combustion that might damage the blow pipe or tuyere. But there is a risk of forming carbon black, which would not burn and could cause problems in the stack.

A second solution is to make a combustion chamber outside the blast furnace and partially burn the reducing material until there is no free carbon left. But this leads to a slightly oxidizing gas at a very high temperature difficult to handle. Furthermore, the device is cumbersome, and the heat losses high.

To inject atomized light fuel oil or natural gas, it is found more convenient to place the injector along the axis of the blowpipe at a distance from the end of the tuyere equal to about four times its diameter. In that way, the outer surface of the flame does not touch the inner wall of the tuyere, and there is enough precombustion to avoid the formation of carbon black. The fuel or gas flame should be inside the coke flame, or in other words the raceway. Cracking should be avoided in the injection tube in the axis of the blowpipe. Compressed gas passes at high enough velocity inside the small-diameter stainless steel tube to keep the inner wall temperature below the cracking temperature.

Quantity of Atomizing Air

When injecting fuel oil, the atomizing air passes around the fuel tube and inside a stainless steel tube which itself is protected against convection and radiation by an outer thin tube of high-alloy steel. Thus, the quantity of atomizing air can be kept below 0.3 lb./lb. or fuel. This is important because compressed air is expensive and cools the blast; thus with 0.5 lb. of air per lb. of fuel, 8 per cent. of the superheating of the hot blast is absorbed by the cold air. Compressed air can with advantage be replaced by natural gas or coke-oven gas.

Safety devices should be installed that cut off gas or fuel, if the bustle pipe pressure, or if the air flow in one single tuyere drops to a preset level. It would indeed be dangerous to continue injecting oil or gas into a blowpipe with the tuyere plugged by slag, for the gas would burn in the bustle pipe and probably damage it.

Since hydrogen is very efficient at high temperatures, it is desirable to inject it as low as possible in the furnace, preferably through the normal tuyeres, where it has more chance to react with the solids, be well mixed with the main stream of gases and be distributed over the cross-section of the furnace. Nevertheless, it may be interesting to inject some material through another set of tuyeres, higher in the furnace, in the bosh for instance, to help the burden in a furnace with a worn-out lining to move down more evenly. By this technique, a larger quantity of material can be injected, since the temperatures at bosh level are much lower than at the tuyeres. In addition, a top gas of high calorific value can be produced.

Fuel-oil injection tests, carried out on No. 3 blast furnace of the Forges et Aciéries de Pompey,

were sponsored by the European Coal and Steel Community. The furnace has eight tuyeres and burns 270 short tons of coke per day. The burden consists of a mixture of unscreened acid and basic Minette ore, under 10-in. Metallic iron additions were kept at a minimum. Average percentage analysis of the hot metal was: Si, 0.5; Mn, 0.4; P, 1.8; C, 3.5; and S 0.040.

Three Techniques

The first part of the test consisted of a two months' reference period and eight periods of one week, during which several techniques were tested, including injections of fuel oil in the bosh and in the normal tuyeres through two, four, and then eight points, with and without utilizing bosh tuyeres. Low- and high-sulphur fuels were used; the fuel rate range explored was from 60 to 160 lb./ton hot metal. Finally, three techniques were selected, and each was tested over a one-month period.

First Period.—Light fuel oil atomized with compressed air was injected along the axis of the blowpipes of the eight normal tuyeres at the rate of 90 lb./ton hot metal. To compensate for the cooling effect of the fuel and the cold compressed air, the blast temperature was raised from approximately 800 to 900 deg. C. In order to tap the same quality iron, the charge was increased until the coke rate had dropped by 205 lb. or by 10 per cent. The furnace was blown so that the flue dust production remained constant at 400 lb./ton hot metal. Under these conditions, the coke rate was maintained and iron production increased by 10 per cent.

Second Period.—The furnace was driven under the same conditions as during the first period, except that two of the four bosh tuyeres were put into service. The fuel oil rate did not change, but the coke rate increased by 60 lb., the result being an extra 8 per cent. gain in production, making a total of 18 per cent. The flue dust per ton hot metal increased to 500 lb.

Third Period.—The injection of atomized fuel oil was made in the blowpipes of the four bosh tuyeres in service. The fuel rate was kept at the same level, but, for the same increase of 18 per cent. in production, the coke rate increased by 40 lb. The operation was not as satisfactory as the previous tests.

The quantity of fuel oil injected per ton hot metal corresponded closely to the figure calculated by the method described. But the superheating of the air had to be corrected because of the larger volume used as compared with the 0.5 ratio used in the calculation.

The working conditions of the furnace improved markedly. There was an increase of the metal temperature of 10 deg. C., and the sulphur in the iron dropped by about 40 per cent. with the S partition coefficient changing from 25 to 40.

Natural gas injection tests were performed on No. 3 blast furnace at the Le Boucau works of the Compagnie des Ateliers et Forges de la Loire, these tests being sponsored by Sidérurgie Française and Gaz de France.

The furnace has six tuyeres and burns 155 tons of coke per day. The burden is made up of a mixture of several unscreened siliceous hematite ores of high iron content and limestone. The hot metal (foundry iron) had the following percentage analysis: Si, 2.5; Mn, 0.8; P, 0.08; and C, 4.0. The slag weight was 800 lb. /ton hot metal and had a basicity index of 1.2.

Natural gas from Lacq (97 per cent. CH_4) was injected at 125 lb./sq. in. along the axes of the six blowpipes. The blast temperature was raised step by step during two weeks from 790 to 1,020 deg. C. At the same time, the gas flow rate was gradually increased to 22,000 cu. ft per hr. Calculations had shown that 8 cu. ft. of gas should be injected per 1,000 cu. ft. of hot air for every 38 deg. C. superheat of the blast. This rule was followed, and experience showed that a slight deviation from it produced either hanging or cold iron of low silicon content.

When the furnace blast temperature was stabilized at 1,020 deg. C., the coke rate had been reduced by 16.6 per cent. or 296 lb. of dry coke/ton hot metal with an injection of 2,880 cu. ft. of natural gas/ton hot metal. Iron production went up by 14.6 per cent. and was limited only by the capacity of the charging equipment. Utilization of the injected hydrogen as a reducing agent averaged 40 per cent., whereas carbon monoxide utilization was less than 20 per cent.

The top-gas flow rate was kept at the same level as with previous practice, while the hydrogen content of the top gases increased to 6 per cent. from 2.1 per cent. The high velocity of the natural gas changed the mechanical conditions of the raceway. Investigations with probes in the stack at the beginning of the test showed that the gas flow was uneven and central. The tuyeres were shortened by 2 in., and gas distribution came back to normal, as was shown by investigating the gases in the stack along two perpendicular diameters.

Conclusions

The thermal gradient in a blast furnace, and especially the temperature of the combustion zone in front of the tuyeres, should be kept as they were when it was operating satisfactorily without injections. Superheating or oxygen enrichment of the blast to compensate for the cooling effect of the injection can be calculated by a thermal balance of the combustion. At all times, there should be sufficient reducing gases in the stack to achieve the indirect reduction compatible with the reducibility of the burden and the driving rate.

A simplified method of calculation, based on the knowledge of the normal performance of the furnace and on two simple assumptions, which can be checked, gives the performance of the furnace with injection, the accuracy being sufficient to plan an injection test programme.

Results of tests performed at the International Low Shaft Blast Furnace at Liège and industrial-size furnaces at Pompey and Le Boucau in France

with fuel oil, natural gas, rest gas, steam, oxygen enrichment, and superheating of the blast have substantiated the assumptions made and confirmed the results of the calculations.

The results have shown that:—

(1) Only fast driving rates on furnaces charged with rich sinter can justify the use of oxygen enrichment with the injection of hydrogen-bearing materials.

(2) Blast temperature should be as high as the stoves permit.

(3) Materials high in hydrogen should be used when the driving rate is fast as is the case when the burden is not prepared.

(4) Materials high in carbon are adapted to normal production rates with high-temperature blast.

(5) For slow driving rates, nitrogen can profitably be injected into the cold blast.

(6) Nitrogen injection into the cold blast can be used as an efficient means of thermal regulation of the furnace.

If the new techniques and materials, as well as the important investment put into charge preparation, are to be exploited to the maximum, new blast furnaces should be designed for:—(1) High production rates—125 short tons per 1,000 cu. ft. of working volume per day; (2) charging with hot self-fluxing sinter containing more than 55 per cent. Fe; (3) blowing with air at 1,150 deg. C. with hydrocarbon injection into the tuyeres and (4) a top pressure of from 60 to 70 lb./sq. in. to prevent fluidization.

New Literature

BRIEF mention is made below of a selection of the house magazines, catalogues, booklets, and other publications recently received. Readers wishing to obtain a copy of any of the items should apply direct to the address given, at the same time mentioning IRON AND COAL.

TRUMETER COMPANY, LIMITED, Milltown Street, Radcliffe (Lancs)—A number of new instruments in the "Trumeter" range of counting and linear measuring machines are described in "Man Must Count" (catalogue No. 61/1).

ATLAS COPCO (GREAT BRITAIN), LIMITED, Maylands Avenue, Hemel Hempstead (Herts)—One of the several illustrated articles in the latest issue (Vol. 4, No. 1) of Compressed Air Comments describes the Swedish ladder drilling method.

ALCAN INDUSTRIES, LIMITED, Bush House, Aldwych, London, W.C.2—Construction of an aluminium aqueduct in Switzerland is described in the March issue of Aluminium News, which also contains notes about the use of the metal in many other projects.

WILD-BARFIELD ELECTRIC FURNACES, LIMITED, Elecfurn Works, Otterspool Way, Watford By-Pass, Watford (Herts)—The sealed quench slipper furnace for clean hardening small components under controlled conditions is the subject of a new pamphlet (SQS.960).

GEORGE KENT, LIMITED, Luton (Beds)—Two new specification sheets have been published. They are SS 010 ("'Commander' Air-operated Receiving Instruments") and SS 013 ("'Commander' Float-operated Open-channel Flow-measuring Instruments").

CROSSLEY BROS., LIMITED, Openshaw, Manchester 11—The latest issue of Crossley Chronicles (No. 217) is devoted to details of the company's exhibits at the Engineering, Marine, Welding, and Nuclear Energy Exhibition at Olympia. Several new items of equipment are involved.

RICHARD THOMAS & BALDWINS, LIMITED, 82, Brook Street, London, W.1—For very nearly 90 years, since the tiny hamlet of Gower Road, in Glamorgan, first began to be rocked by the vibrations of a giant hammer, a steelworks has flourished there. The story of RTB's Gowerton Works is told in the April issue of Ingot News.

NATIONAL UNION OF MANUFACTURERS, 6, Holborn Viaduct, London, E.C.1—Wales is described as "The Land of Opportunity" by Sir Miles Thomas in the April issue of the British Manufacturer (2s.). Sir Miles is chairman of the Development Corporation for Wales and his article is followed by a 10-page feature on South Wales and Monmouthshire.

DAVID BROWN CORPORATION, LIMITED, Huddersfield—During the past year, Harrison, McGregor & Guest, Limited, Leigh (Lancs), the machinery manufacturing division of David Brown Tractors, Limited, has undergone extensive changes. The expansion of the Leigh works is described in the April-June issue of Newsletter, which also contains news from other companies in the group.

BRITISH OXYGEN COMPANY, LIMITED, Bridgewater House, Cleveland Row, St. James's, London, S.W.1—Front page lead story in the April issue of Pennant is given to details of the third oxygen plant capable of producing 200 tons of high purity oxygen a day being built for Richard Thomas & Baldwins' Spencer Steelworks. The issue is packed with group news from home and abroad.

TEES-SIDE AND SOUTH WEST DURHAM CHAMBER OF COMMERCE, North Eastern Bank Chambers, Marton Road, Middlesbrough—Among the news of industry contained in the April issue of the Tees-side Journal of Commerce are details of further major extensions of plant to be carried out by Imperial Chemical Industries, Limited, on Tees-side, both the Wilton and Billingham works being involved.

ARMSTRONG WHITWORTH (METAL INDUSTRIES), LIMITED, Close Works, Gateshead 8 (Co. Durham)—News about people and products of the company is published quarterly in Close-up, a first-class magazine of its type with a very glossy cover. A feature of the March issue is the story of Sir Joseph Whitworth (1803-1887), well put together by M. T. Downes. Close-up contains several articles technical in character and a number of contributions very much on the lighter side.

MICROMETRICAL MANUFACTURING COMPANY, Ann Arbor, 3621, South State Road, Michigan, USA—Measuring and recording roundness, flatness, roughness, waviness, scratches, flaws, and total surface profiles are described in detail in a new four-colour brochure on

the "Proficorder." Used in both the laboratory and shop, the "Proficorder" provides profile records of practicaly any type of surface that can be produced by normal production methods, including metals, plastics, and glass.

INTERNATIONAL NICKEL COMPANY (MOND), LIMITED, Thames House, Millbank, London, S.W.1—An apt illustration of the wide range of industries and applications in which nickel plays an important role is provided by the abstracts in the latest (February) issue of the Nickel Bulletin. As usual, the section concerned with heat- and corrosion-resisting materials is the largest of the issue, the literature abstracted ranging in content from the mechanical properties and fabrication of heat-resisting stainless steels and high-temperature alloys, to materials suitable for handling liquid gases, studies of passivity in stainless steels, and the resistance of nickel-containing alloys and steel to specific corrosive media.

FEDERATION OF BRITISH INDUSTRIES, 21, Tothill Street, London, S.W.1—The part that good translations can take in exports (or the damage that can be done by bad) needs no stressing. Signs are that British industry is becoming aware of the importance of properly trained and qualified linguists. There is an article on "Translators for Industry" in the April issue of the FBI Review (2s. 6d.), one of the joint authors being Alan G. Readett, head of the National Coal Board translation service. S. C. Ginn, commercial manager of the National Industrial Fuel Efficiency Service, writes on the achievements of the organization in its first seven years. The report is an impressive one. There are many other features to interest the businessman.

BRITISH IRON AND STEEL FEDERATION, Steel House, Tothill Street, London, S.W.1—Ron Barry, features editor of Safety, and W. M. Larke, deputy chairman of the federation's Accident Prevention Committee, recently crossed the Atlantic to find out what could be learnt from the Americans about accident prevention. Their first report is given in the spring number of Safety, the magazine of accident prevention and industrial health published by the BISF Accident Prevention Committee. The steel division of the Steel Company of Wales, Limited, Port Talbot, found that a quarter of its accidents were hand and finger injuries. Denis Thomas describes how the rolling mills superintendent, the safety department, and the medical staff co-operated in a research project which has resulted in a dramatic reduction in hand injuries. The Park Gate Iron & Steel Company's five-year "Education for Safety" scheme has entered a new phase. E. A. Cotterill, the company's blast-furnace superintendent, gives Safety readers a report on the latest development.

RAILWAY MODERNIZATION CONFERENCE

FIRST comprehensive account of the engineering work involved in the plan for the modernization of British Railways will be presented at the Railway Modernization Conference at the Institution of Civil Engineers, Great George Street, London, S.W.1, on Wednesday and Thursday of next week.

The conference, to which many oversea railway representatives will be coming, has been arranged jointly by the Institutions of Civil, Mechanical, and Electrical Engineers.

Flexible Couplings for Steelworks

AT the new Spencer Steelworks of Richard Thomas & Baldwins, Limited, Newport (Mon), the LD oxygen-blown steelmaking process will be employed in conjunction with converters which will be electrically tilted, the drive being engaged through large internal-gear flexible couplings designed and manufactured by Crofts (Engineers), Limited, Bradford (Yorks).

Three of these couplings are being built into the

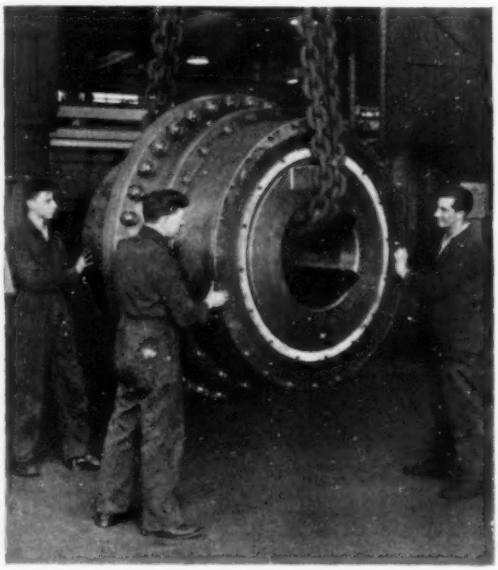


FIG. 1.—INTERNAL GEAR FLEXIBLE COUPLING.

installation, each being some 73 in. dia. and weighing 11.8 tons; and each is rated equivalent to 45,000 h.p. at 100 r.p.m. They are the largest ever made by Crofts and probably the largest of this type ever made. The teeth of these gears will be barrelled to accommodate a considerable degree of misalignment.

Sponge Iron Industry for W. Australia

General conditions for the establishment of a £10,000,000 sponge iron industry have been agreed by the Western Australian Government and Mineral, Mining & Exports (W.A.), Pty., Limited. The industry will use the iron ore of the Scott river deposit in the south-west of the State. The leases held cover 14,000 acres and it is proposed to establish a plant costing £5,000,000 by December, 1964. Wharf and loading facilities must be constructed at Flinders Bay. Initial capacity is placed at 250,000 tons of sponge, or pelletized, iron per year.

FURNACE COKE PRODUCTION

Readjustments and Developments in the US

During the past four decades there has been a drastic change in the original basis of furnace coke production and distribution in the US, Great Britain, and elsewhere. It has been almost entirely due to the rapid expansion of natural oil supplies and the subsequent development of techniques for extracting almost the whole range of by-products previously obtained by coal carbonization. The subject from the American viewpoint has been described by Mr. John B. Shallenberger, president, Connellsville Corporation, Conellsville, Pa., in an article in the February issue of Coal Age. Extracts are given below.

INTRODUCTION of the first by-product ovens early in the present century, compared with the simple beehive ovens then generally employed, was a revolutionary advance in coke making. The value of the by-products exceeded all expectations, paying as they did the entire cost of operating the ovens. The new plant, however, was expensive to build and also to operate, capital investment costs and wages often exceeding the resources of the mineowners.

Coke production, therefore, to a large extent gradually passed into the hands of the wealthy and enterprising iron and steel producers. Fortunately for them, coal could be transported about as cheaply as coke from the mines to the steelworks, because coal was less bulky than coke. It required about three lightly loaded freight cars to move the same amount of carbon in the form of coke compared with two heavier car loads in the form of coal equivalent.

Today, the mines are finding new sources of profits by restarting or expanding coke production, using modern labour saving coke-oven equipment. Widespread change is imminent, largely because of the completely external factors. The rich glitter of by-products has begun to fade—not because by-product ovens have not been efficient, not because steel companies failed to operate them to their maximum potential, and not because anything happened to the quality of the raw materials.

The villain in the piece was competition and that in the form of petrochemicals, which appeared on the scene concurrently with rapidly accelerating oil production, and had a natural advantage over the same chemicals produced from coal. Oil was already a liquid. Chemicals made from oil were, for this and other reasons, less costly than coal chemicals. Coal by-products, in country after country, no longer could bring home a price sufficient to meet their high labour cost and capital investment charges.

Only naphthalene has remained, among the valuable coke chemicals, in the coke producers' competitive domain; but research workers are already claiming a naphthalene-substitute breakthrough, and their claim suggests that naphthalene, too, will be a lost market to the coke industry.

Excess gas from by-product coke ovens retains value as locally available fuel. Some steel producers, including some which have abandoned normal by-product recovery, are now piping coke-oven gases directly to blast furnaces to provide additional heat and some additional fuel. Considering the dwindling markets for coal chemicals and the high capital cost and extremely high operating labour cost of by-product coke ovens, coal chemicals face an uncertain future. The eventual emergence of petrochemicals as a world wide competitive winner is clear, but that is not to say that petrochemicals will be the only finalist. Market demand is expanding, and demand enough for both petrochemicals and coal chemicals is visible in at least the distant future. Moreover, world resources would suggest, also for the distant future, earlier depletion of petroleum resources than of coal.

If coal outlives petroleum, coal by-products will, of course, come back into their own. For the time being, by-product oven operators are taking another look at the economics, which were so clearly in their favour at the outset. Some of them are slowing the pace of coke-oven expansion. Very few, if any, are risking the capital cost of new by-product coking plants. Many are studying the possibilities of operating their existing by-product ovens on a non-recovery basis, and some are already doing so.

The portent of all this to the coal industry today has nothing to do, it seems, with the overall demand and consumption of coal. But it will greatly affect the integration and breadth of coal-mining company operations. What form this forward integration will take, what facilities the coal companies will install, and what commercial commitments they will undertake is open to speculation.

Facilities are expensive, and if coal companies are going to enter an additional business, or to absorb additional business, or an additional stage in the process through expansion into industries other than coal mining, they will want to be

assured of markets for their new venture. The most likely commercial development, already demonstrated in some countries, is the spread of long-range coke supply contracts. One coal company has recently contracted to supply coke for 10 years to a distant steel company, and another coal concern has recently entered an agreement to supply coke for 10 years to a neighbouring chemical plant. A further coal company is reported to have contracted to supply coke for 15 years to another somewhat distant steel plant. Many others are being approached by steel users, or are selling and offering contracts for long-term coke supplies on contract. With the prospect of growing and continuing demand, many coal-mining companies will quickly, some by late 1961, re-enter the coking industry which they abandoned in years gone by.

One can only surmise the direction taken by coke-producing companies regarding future developments. Some will see such expanding markets for chemicals that they will not hesitate to extend existing by-product coke-oven plants, either with full-scale completely integrated facilities like the magnificent coke installations owned by steel companies and others today, or less elaborate "semi-by-product" facilities designed for recovery of tar, gas, and light oils only.

Others will forgo all hope of by-product markets and non-recovery ovens. Some of the non-recovery oven operators will go back to the old beehive ovens—the cheapest to buy and the quickest to put into operation. Others will be concerned about the high labour cost of operating beehives, and will choose horizontal slot-type ovens, which lend themselves to easy mechanization. Some coke operators will see advantages in the rotary coke oven.

The most popular among these alternatives, according to present indications, will be the horizontal slot-type oven, sometimes with auxiliary equipment to catch the smoke and recover gas, tar, and light oils for sale in unrefined form. Even including this recovery equipment, the cost of horizontal slot-type ovens is lower than that for vertical slot-type ovens, and the number of men required to operate them, compared with by-product coking plants of the same capacity, is but a fraction.

CABLE SUPPORT at CYNHEIDRE COLLIERY

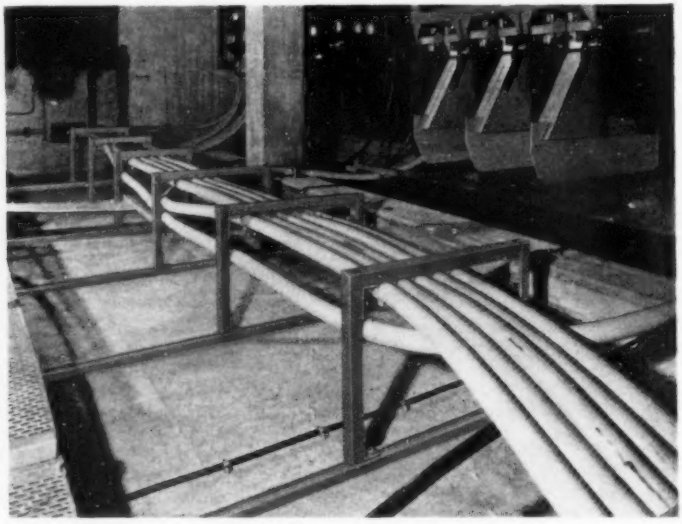


FIG. 1.—UNISTRUT CABLE SUPPORT AT A SUBSTATION AT CYNHEIDRE.

COMPLEXITY of services to machines, power, lighting points, and other electrical equipment at Cynheidre Colliery, in South Wales, required miles of cables, lighting fittings, trunking, pipes, switchgear, and racking. The Unistrut steel channel system (Fig. 1) which can be fixed in a variety of ways, was adopted to solve the particular problem.

The system consists of a steel channel, manufactured in three sizes to suit variance in structural requirements, and cut into standard lengths. The main link in the system is the self-locating nut assembly, which, fitted with a spring, holds itself against the inner walls of the channel until it is tightened, when two serrated grooves bite into the inturned channel edges to form a secure fastening.

The Unistrut wall support, let into the concrete during the construction of the mine, saved any necessity for drilling or plugging at Cynheidre. The system, manufactured by the Unistrut Division of Sankey-Sheldon, Limited, Welwyn Garden City (Herts), one of the Guest, Keen & Nettlefolds group of companies, permits any combination of pipes and cables to be suspended neatly and securely, allowing for easy maintenance access and visibility.

DRAINAGE *of* WASHED COAL *by* VIBRATION

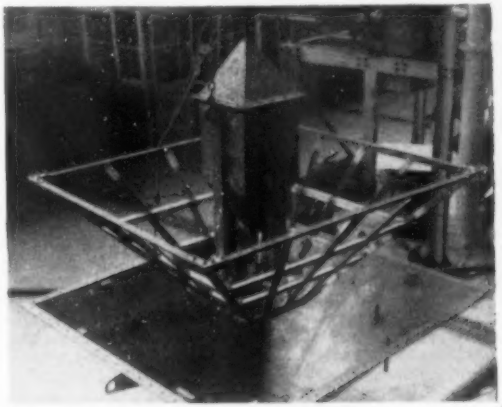


FIG. 1.—LOWERING THE STEEL BASKET INTO THE DRAINAGE BUNKER.

DAMPING of a wet aggregate produces a close packing of the solid particles with the consequent displacement of water to the top. Attempts were made at the Central Engineering Establishment of the National Coal Board to utilize this principle for more rapid dewatering of washed small coal in drainage bunkers. The tamping effect was produced by vibrating the mass of coal in the bunker, and the water was removed from the top by perforated drainage tubes.

Considerable success was achieved on a model bunker of 1 cwt. capacity, but on scaling-up to a bunker of 15 tons capacity the advantage gained by more rapid dewatering was offset by the difficulty encountered in discharging the closely packed solids. In some cases, on opening the bunker door it was impossible to make any impression on the tightly packed mass with a crowbar. The difficulty in discharging was overcome to some extent by the use of an air blast.

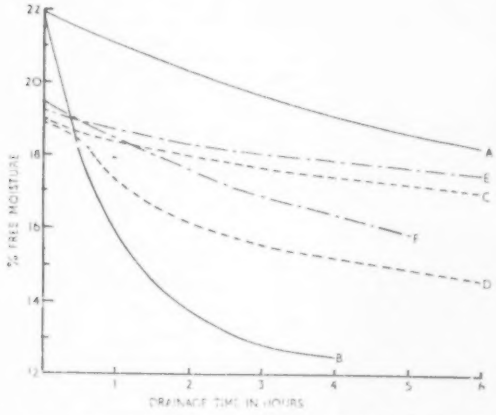


FIG. 2.—RELATIVE RATES OF DRAINING IN BUNKERS OF DIFFERING CAPACITY. 1-CWT. BUNKER, NATURAL DRAINAGE A, WITH VIBRATION B. 8-TON BUNKER, C AND D. 15-TON BUNKER, E AND F.

The most suitable method of transmitting the vibration to the mass of coal was found to be a steel basket construction in the bottom of the bunker. Fig. 1 shows the basket suspended above the bottom section of the 15-ton bunker into which it fits: it also shows one method of attaching the vibrating unit, which in this case consisted of two 800-W electric rotary vibrators mounted on horizontal axes at right-angles to each other housed in a sealed container.

In an endeavour to improve discharge, the vibrators were later removed from inside the bunker and attached rigidly to the bottom of the basket, but outside and insulated from the bunker shell. From the point of view of vibration transmitted to the mass of coal, this arrangement worked equally well, and there was some improvement in discharging.

Fig. 2 shows the relative rates of draining, both natural and with vibration, in three bunkers of different capacities. These curves indicate that the advantage gained by dewatering by vibration becomes progressively less as the mass of coal increases. Coupled with this, the difficulties encountered in discharging become progressively greater.

BRITISH STANDARD 18, dealing with the tensile testing of metals is to be revised. The revision will take into account the proposals and recommendations of international technical committees concerned with the tensile testing of metals, and will absorb Section A of BS 485, dealing with the testing of thin metal sheet and strip. The drafting committee will consider the adoption of the $5.65\sqrt{A}$ proportioned test piece as a primary standard in the place of the former $4\sqrt{A}$ form, and the possibility of including elongation conversion charts in the appendix.

New Equipment and Products

Handling Scrap Metal

A NEW system of scrap metal collection and disposal has been introduced in Scotland by C. W. Ireland, Limited, Hamilton, with the addition of a special six-wheeled Albion Reiver truck to its fleet.

The Reiver is the first vehicle in Scotland to be fitted with the Dempster-Dinosaur system of materials handling, manufactured under licence in the United Kingdom by Powell Duffryn Engineering Company, Limited, Cardiff. The system makes use of a number of detachable containers which can be picked up, transported, tipped, or set down on the ground by the collecting vehicle. All operations are controlled by the driver, from simple controls in the cab.

Tractor-drawn Dumper

CLAIMED by Mackay Industrial Equipment, Limited, Feltham (Middx), its sole distributor, to be the first British detachable, self-loading dumper on the market, the Morewear Goose (Fig. 1), manufactured at the new factory of R. Smith (Horley), Limited, was demonstrated on a site at the Royal Festival Hall, London, recently.

Answering a demand for tractor-drawn dumpers, the Goose, utilizing the new Fordson Super Major diesel tractor, forms a complete unit to pull heavy loads at low running costs. Basically, it consists of a ruggedly constructed tipping body carried on a two-wheeled H-frame chassis which is coupled to the power unit by a goose-neck extension.

One of the features of the design is the connection between the power unit and the tractor. This is a quick-release ball coupling which permits the dumper to be detached from the tractor in less than 90 sec. This coupling gives the Goose considerable versatility, as one tractor can handle several dumper units, or be used for other duties. Full advantage of the quick release coupling is obtained when the tractor is fitted with hydraulic shovel equipment. This enables the dumper to become a completely self-contained loading, hauling, and dumping unit, operated by only one man.

FIG. 1.—THE MOREWEAR GOOSE FITTED WITH 1-CU. YD. HYDRAULIC SHOVEL, PROVIDING A SELF-LOADING DUMPER UNIT.

Loading Shovel has New Features

NOW available in this country is the Case W.5 Terraload'R front-wheel drive, rear-wheel power-steered loading shovel. Marketed by the J. I. Case Company, Limited, Mill Road, West Drayton (Middx), the machine has a 1-cu. yd. (standard) bucket, torque converter drive, and a 57-h.p. Case diesel engine. The design of this machine is such that it will work at speed with a high degree of stability.

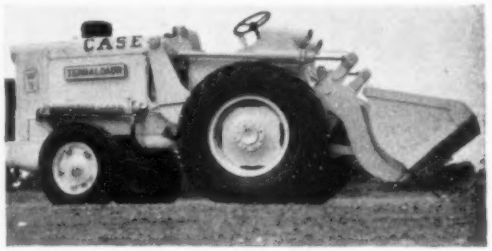


FIG. 2.—CASE W.5 "TERRALOAD'R."

Power-operated shuttle transmission works through four forward and four reverse speeds, up to 18 m.p.h. forward, and 23 m.p.h. in reverse. The 90 per cent. power-assisted hydraulic steering allows a 360 deg. turn in a circle of 10 ft. 5 in. radius. Some 60 per cent. of the machine weight is carried by the rear wheels to allow optimum balance when the machine is travelling loaded or empty. Static lift capacity is 4,500 lb., while the carry capacity at 4 m.p.h. is 3,000 lb.

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Both the preparations in question have been developed for spray application, and dry within 3 min. It is, therefore, possible

to shotblast very large areas without interruption, dust down, and apply a spray coat. The surface so prepared is resistant to rust for approximately a year and is capable of receiving any type of paint, adhesion to this surface being excellent.

Electromagnetic Flowmeter

A LOW-CONDUCTIVITY electromagnetic flowmeter system which considerably extends the range of applications on which this type of meter may be used has been developed by Fischer & Porter, Limited, Salterbeck Trading Estate, Workington (Cumberland).

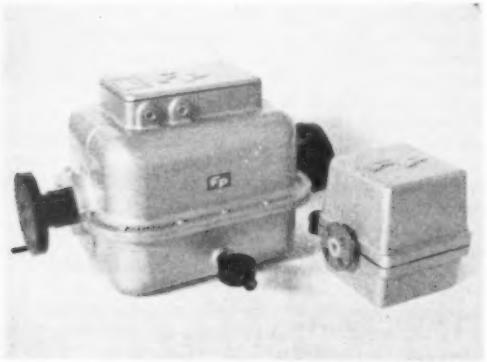

FIG. 3.—ELECTROMAGNETIC FLOWMETERS WITH 2-IN. FIBREGLASS TUBE (LEFT) AND WITH $\frac{3}{8}$-IN. PTFE LINED TUBE (RIGHT).

Hitherto it has been impossible to use magnetic flowmeters for handling fluids with a conductivity of less than 20 micromhos/cm., but with the introduction of certain design changes the firm has produced a magnetic flowmetering system which will handle liquids and slurries with a conductivity as low as 0.1 micromhos/cm. This means that the rate of flow of fluids not far removed from pure hydrocarbons can now be accurately determined.

Austin-Western Crane

ARRIVAL of the first Austin-Western Model 210 hydraulic crane (Fig. 4) in the UK is announced by Jack Olding & Company, Limited, Hatfield (Herts). With its all wheel steering and telescoping boom, which can swing in a continuous full circle, the 210 operates particularly well in tight, cramped working conditions, with low overhead clearances. Mounted on rubber tyres for work in or out of doors, it gives travel speeds of up to 19 m.p.h.

Among the attachments available for this machine are clamshell and orange peel buckets, electro magnets, maintenance platforms, and mechanical winches.

FIG. 4.—OPERATING THE AUSTIN-WESTERN MODEL 210 HYDRAULIC CRANE UNDER LOW-CLEARANCE CONDITIONS.

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Weight indication can be given on a visual dial indicator, a full numerical digit indicator, or digital display. Weight recording can be given using a pen recorder or made digitally, with print-out on a ticket or tape. Combinations of these can be supplied if required, and equipment can also be provided to drive teletype and punch card accounting equipment.

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Important features include an extruded rubber lining with a woven jacket impregnated with white P.V.C., which is resistant to most chemicals and virtually proof against attack by mildew. The hose is reinforced internally and externally by high-tensile spiral steel wire armour which gives added protection against crushing.

"Slinky" is stocked in the following sizes:—1¼-in., 2-in., and 3-in. inside diameter, 10-ft., 16-ft., 20-ft., and 25-ft. lengths, with or without gunmetal couplings.

New Equipment and Products

Handling Scrap Metal

A NEW system of scrap metal collection and disposal has been introduced in Scotland by C. W. Ireland, Limited, Hamilton, with the addition of a special six-wheeled Albion Reiver truck to its fleet.

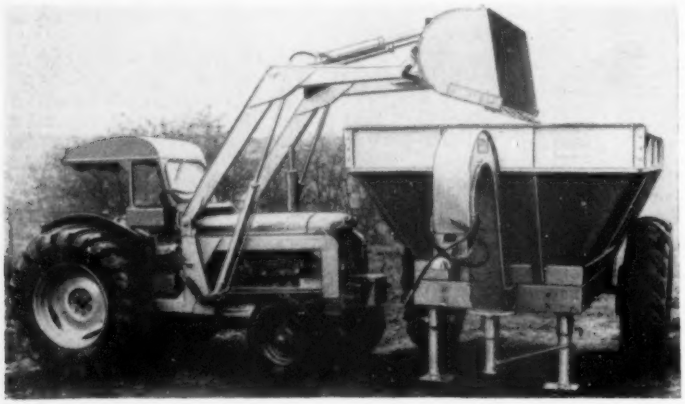
The Reiver is the first vehicle in Scotland to be fitted with the Dempster-Dinosaur system of materials handling, manufactured under licence in the United Kingdom by Powell Duffryn Engineering Company, Limited, Cardiff. The system makes use of a number of detachable containers which can be picked up, transported, tipped, or set down on the ground by the collecting vehicle. All operations are controlled by the driver, from simple controls in the cab.

Tractor-drawn Dumper

CLAIMED by Mackay Industrial Equipment, Limited, Feltham (Middx), its sole distributor, to be the first British detachable, self-loading dumper on the market, the Morewear Goose (Fig. 1), manufactured at the new factory of R. Smith (Horley), Limited, was demonstrated on a site at the Royal Festival Hall, London, recently.

Answering a demand for tractor-drawn dumpers, the Goose, utilizing the new Fordson Super Major diesel tractor, forms a complete unit to pull heavy loads at low running costs. Basically, it consists of a ruggedly constructed tipping body carried on a two-wheeled H-frame chassis which is coupled to the power unit by a goose-neck extension.

One of the features of the design is the connection between the power unit and the tractor. This is a quick-release ball coupling which permits the dumper to be detached from the tractor in less than 90 sec. This coupling gives the Goose considerable versatility, as one tractor can handle several dumper units, or be used for other duties. Full advantage of the quick release coupling is obtained when the tractor is fitted with hydraulic shovel equipment. This enables the dumper to become a completely self-contained loading, hauling, and dumping unit, operated by only one man.



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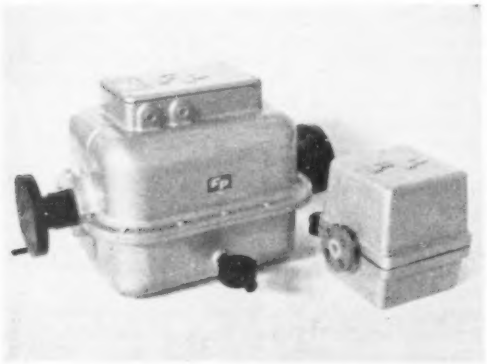

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FORTHCOMING EVENTS

MAY 1

Institute of British Foundrymen (Sheffield Branch):—Annual general meeting at the Technical College, Pond Street, Sheffield, at 7 p.m., followed by discussion on foundry topics.

Society of Engineers:—Meeting at the Engineering, Marine, Welding, and Nuclear Energy Exhibition, Olympia, London, at 5 for 5.30 p.m. "Jet Propulsion for Boats," by R. H. Bound.

MAY 2

Institution of Plant Engineers:—Meeting at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at 7 p.m. "Paints and the Preservation of Steel," by E. W. Marshall.

Institution of Plant Engineers (Peterborough Branch):—Meeting at the White Lion Hotel, Church Street, Peterborough, at 7.30 p.m. Members' papers.

Institution of Electrical Engineers (Measurement and Electronics Sections):—Meeting at Savoy Place, London, W.C.2, at 5.30 p.m. "Structural Properties and Applications of Evaporated Metal Films," by Dr. D. W. Pashley, and "Deposition of Evaporated Non-magnetic Films," by J. R. Balmer.

MAY 3

Institution of Plant Engineers (Edinburgh Branch):—Visit to Brown Bros. & Company, Limited, Rosebank Engineering Works.

Institution of Plant Engineers (Southern Branch):—Meeting at the Polygon Hotel, Southampton, at 7.30 p.m. "Industrial Floors," by W. J. Warlow.

MAY 4

Midland Institute of Mining Engineers:—Meeting at the Royal Victoria Hotel, Sheffield. "Fifth Report on Shotfiring in Yorkshire. Further Investigations into the Ignition Hazards Due to Shotfiring," by the North-Eastern Divisional Shotfiring Committee, NCB.

MAY 5

Institution of Production Engineers (Wales Region):—One-day conference on "The Conservation of Materials" at the South Wales Institute of Engineers, Park Lane, Cardiff, 9 a.m. to 4.30 p.m. Tickets from A. E. Haynes, A.B. Metal Products, Limited, Abercynon (Glam).

MAY 8

Society of Chemical Industry (Corrosion Group):—Annual general meeting at 14, Belgrave Square, London, S.W.1, at 6 p.m. "The Chairman's Evening."

MAY 9

Southern Counties Institute of Mining Engineers:—Visit to the Ford Motor Company, Limited, Dagenham.

Sheffield University Mining Society:—Annual general meeting in the Mining Lecture Theatre, St. George's Square, Sheffield, at 4.45 p.m., followed, at 5 p.m., by "Civil Engineering in the National Coal Board," by C. A. C. Davies, chief civil engineer, NCB.

South Staffordshire and Warwickshire Institute of Mining Engineers:—"Packing or Caving," by W. H. N. Carter, HM Principal Inspector for Special Development Duties.

National Association of Colliery Managers

MAY 5

Lancashire Branch:—Annual meeting and dinner at the Pack Horse Hotel, Bolton.

MAY 11

South Wales Branch:—Visit to the docks and harbour facilities at Milford Haven.

MAY 15

Midland Branch:—Annual general meeting at the Denman's Head Hotel, Sutton-in-Ashfield, at 6.30 p.m.

MAY 25

South Staffordshire, Warwickshire, Worcestershire, and Shropshire Branch:—Annual general meeting.

JUNE 6-8

Annual general meeting and conference in Edinburgh.

Conference on Tigerschiold Tops

WIDESPREAD interest in the use of the Tigerschiold method of hot topping was revealed at the second Tigerschiold Tagung held in Düsseldorf last Friday. The conference was attended by about 125 delegates from Great Britain, Holland, Germany, and Spain. Before the conference the delegates visited steelmaking plant of the Royal Netherlands Blast Furnaces & Steelworks, Limited, and the Hütten-und Bergwerke Rheinhausen A.G., to see the method in use.

The papers discussed included descriptions of routine practice for Tigerschiold hot-topping at steelworks in Holland, Germany, and Great Britain and studies of the use of various refractory mixes for the hot-top lining and of the use of various shapes of Tigerschiold "umbrellas" with a square mould.

The ensuing discussion revealed that there is a large range of refractory materials suitable for linings, while the incorporation of exothermic materials in the lining or parts of the lining may sometimes be practical and economic.

Summaries of the papers and discussions will appear in IRON AND COAL.

"A NEW RECIPROCATING MOULD CYCLE"

MR. J. SAVAGE, author of "A New Reciprocating Mould Cycle to Improve Surface Quality of Continuously Cast Steel," published in our April 14 issue (p. 787), states:—

Fig. 1.—In this diagram the element of ingot shell should be shown as moving downwards at velocity v cm./sec.

Fig. 8.—The caption should read: "Relation between mould acceleration and relative velocity attained between mould and ingot for range of values of R."

Fig. 9.—In this diagram temperature of ingot shell shown as 0 deg. C. against triple arrow should read c_1 deg. C.

Iron-ore Research in Australia

Research into the treatment of iron ore from the Braemar and Tarcoola deposits has been started by the South Australian Government. The research is being carried out by the Australian Mineral Development Laboratories and the work is directed to converting low-grade ore into high-grade iron, following recent Swedish experimental practice.

Recruitment and Training Problems

Problems of recruitment and training in small and medium-sized firms were discussed at a conference in Buxton last September, organized by the Federation of British Industries. Following the publication of "Further Education for Those in Industry and Commerce," which included a summary of the recommendations of the conference, a full report entitled "Invest in the Future" has now been published by the FBI (21, Tothill Street, London, S.W.1, 6s. post free).

FORTH ROAD SUSPENSION BRIDGE

Special Cable Wire by Dorman Long (Steel)

MANUFACTURE of the 7,500 tons of high-tensile steel wire which will be used to make the main suspension cables for the Forth Road Bridge is approaching completion at the Middlesbrough Wire Works of Dorman Long.

The contract was awarded to Dorman Long (Steel), Limited, by the contractors for the superstructure (contract No. 2), namely, the A.C.D. Bridge Company, a consortium formed by Sir William Arrol & Company, Limited, the Cleveland Bridge & Engineering Company, Limited, and Dorman Long (Bridge & Engineering), Limited.

Wire of this high-tensile quality has not hitherto been produced in Europe for this type of bridge. To facilitate the execution of the contract, substantial developments costing £800,000 were undertaken at the wire works. Special plant was installed which will not only increase output, but will also widen the range of wire specifications that can be manufactured.

This decisive step means that Dorman Long (Steel), renowned for the building of structural steel bridges, will now also take a leading part in large suspension bridge projects, such as the Severn. Furthermore, steel in wire form is finding new uses and, hence, fresh problems and new specifications are likely to arise. Such challenges can be well met with the modern equipment of the Dorman Long works. Incidentally, it may be a surprise to many to learn that the company entered the wire-drawing trade 67 years ago, some years before its entry into structural bridge building.

Requirements and Process for the Cable Wire

The wire specification was drawn up as follows:—Diameter, 0.196 in. (+0.003 in. −0.002 in. tolerance); tensile strength, 100 to 115 ton/sq. in. (with an average tensile of not less than 102 ton/sq. in.); 0.2 per cent. proof stress, 75 ton/sq. in. minimum; elongation, 4 per cent. minimum on 10-in. gauge length; wrapping test, on three times wire diameter, hot-dip galvanized to BSS 443 (a 100-ft. length under a tension not exceeding 300 lb. must be perfectly straight); coil weight, 850 to 1,050 lb.

To meet this stringent specification a quality control system had to be enforced right from the initial blast-furnace operation to the final galvanizing process. The wire production starts with a 4/0 gauge rod (0.400 in. dia.) having an analysis of carbon 0.75 to 0.80 per cent. and manganese 0.50 to 0.70 per cent., supplied by the Lackenby rod mill. On receipt of this material every coil is tested at both ends to ensure freedom from internal and surface defects (including decarburization).

Tested and proved material goes forward to the initial heat-treatment process. This operation, known as "patenting," is carried out by heating the rod, in strand form, to a temperature of 950 deg. C., followed by quenching into lead at 510 deg. C. and maintained at this temperature for a predetermined time, after which the rod is rewound into coil form. The rods are again tested to ensure uniformity of physical properties as follow:—Tensile strength, 72 to 78 ton/sq. in.; elongation, 8 per cent. minimum on 10-in. gauge length; reduction of area, 30 per cent. minimum.

The heat-treated rod is then pickled or cleaned by immersing in a dilute solution of cold hydrochloric acid for 30 to 40 min. When all the oxide has been removed the rods are thoroughly washed, then phosphate coated, lime dipped, and "baked" dry.

Cleaned rod passes to the wire-drawing department, where the rod of 0.400-in. dia. is reduced in five drafts to 0.192-in. dia. at a finishing speed of 630 ft./min. (Fig. 1). For this operation coils are joined by welding; the welds, which must be removed after drawing, are marked with a special paint which enables their progress to be followed right through the machine.

The material is now referred to as wire and at this stage must conform to the following physical properties:—Diameter, 0.192 in. to 0.195 in.; tensile strength, 113 to 120 ton/sq. in.; elongation, 2 per cent. on 10-in. gauge length; wrapping test on own diameter.

After testing, the wire passes forward to the hot-dip galvanizing operation. The wires are

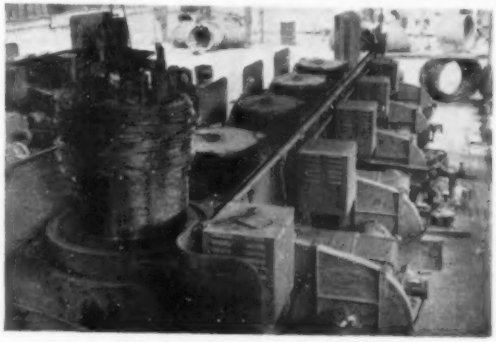


FIG. 1.—FIVE-HOLE PATHFINDER WIRE-DRAWING MACHINE ON WHICH WIRE FOR THE FORTH ROAD BRIDGE IS BEING PRODUCED.

passed through this plant in strand form, 18 wires being dealt with at one time giving a weekly output of 150 tons. In the galvanizing process the wire passes through several baths as indicated below.

LOW-TEMPERATURE LEAD BATH.—Operating at 435 deg. C. and designed to burn off excess wire-drawing lubricant and to "stress relieve" the wire.

PICKLING BATH.—Using a hot dilute solution of hydrochloric acid to clean the wire surface to ensure good zinc adhesion.

WATER WASH.—Both by spray and constantly overflowing bath to remove any trace of acid.

FLUX BATH.—A hot solution of a proprietary brand of flux.

ZINC BATH.—A molten bath of highest purity zinc maintained at 435 deg. C. The wires leave this bath vertically through a wiping bed of oiled charcoal. After leaving the wipe the wires continue in the vertical plane for 35 ft. then passing over a 5-ft. dia. pulley and down to be recoiled on 5-ft. dia. winding blocks. This specially high take-up frame (Fig. 2) gives an adequate and controlled cooling rate of the wire while it is straight, ensuring that the wire will "lie" relatively straight.

Each coil of finished wire is subjected to final testing and inspection to ensure conformity with the relevant specification. This final inspection is supervised on a 24-hr. basis by a representative of an independent inspection authority.

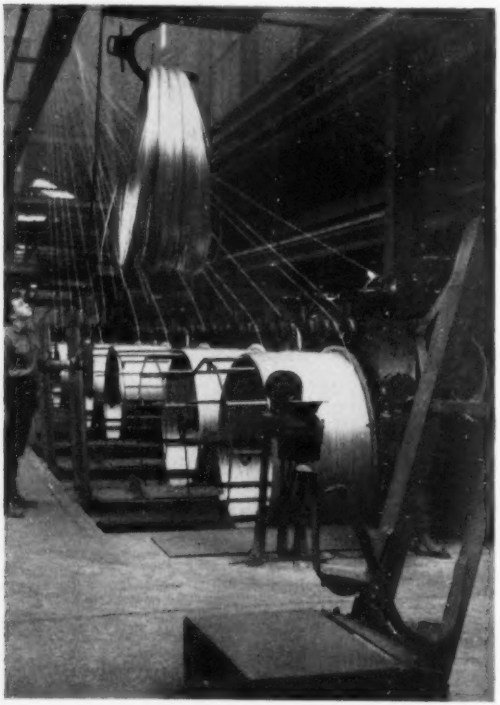


FIG. 2.—HIGH TAKE-UP FRAME ON GALVANIZING LINE SPECIALLY INSTALLED FOR PRODUCING WIRE FOR THE FORTH ROAD BRIDGE.

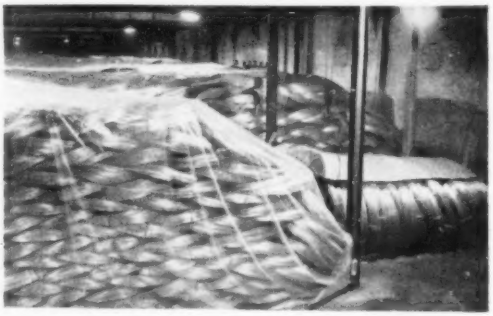


FIG. 3.—SOME OF THE 7,500 TONS OF HIGH-TENSILE WIRE WHICH DORMAN LONG (STEEL), LIMITED, IS SUPPLYING FOR THE SUSPENSION CABLES FOR THE FORTH ROAD BRIDGE. THE WIRE IS STORED IN POLYTHENE CONTAINERS EQUIPPED WITH DEHUMIDIFIERS TO PREVENT RISK OF RUST.

Wire passing this inspection is bundled and labelled to show:—Cast number, coil number, right- or left-hand wound; size, above or below nominal; individual coil weight. Thus, any coil can be traced back through its entire history.

Finished wire is held in storage prior to use on the bridge site. To prevent deterioration while in store, the wire is stacked in long rows which are completely sealed in polythene sheets (Fig. 3). Additionally, a dehumidifying unit is placed at each end of each row to reduce the relative humidity of the entrapped air and prevent white rusting.

Material will be despatched by rail to the bridge site at the rate of 800 tons per week.

Chemistry of Steel Production

MAIN lines of research in the Department of Metallurgy at the Royal College of Science and Technology, Glasgow, according to the Report on Research, Session 1959-60, have been concerned with the chemistry of iron and steel production.

The thermodynamics of the partition of sulphur between molten slag and iron of different compositions are being worked out in order to further the understanding of the mechanism of sulphur elimination in iron-making. The equilibrium between chromium and oxygen in molten iron, which is of interest in the manufacture of low-carbon stainless steel, is being studied at temperatures up to 1,750 deg. C. A parallel research on the equilibrium between aluminium and oxygen which is also in progress should provide more reliable fundamental data on the deoxidation of low-carbon steels than is presently available. The study of the thermodynamics of molten iron-silicon and iron-carbon alloys is continuing.

A limited study on the kinetics of the austenizing and tempering of high-carbon steels has been undertaken in collaboration with a local firm. The investigation of damage to crystals, and the generation and decay of vacancies by mechanical deformation and heat-treatment has been continued, and damage by fatigue correlated with that due to tensile stressing.

Pig-iron and Steel Production

IN the following United Kingdom pig-iron and steel statistics, issued jointly by the Iron and Steel Board and the British Iron and Steel Federation, Table 1 gives the production of pig-iron and ferro-alloys and the number of furnaces in blast in February. Table 2 gives the production of steel ingots and castings in February and Table 3 gives details of finished steel in January. Activities of the industry are summarized in Table 4.

TABLE 1.—*Weekly Average Production of Pig-iron and Ferro-alloys in February, 1961.* (*Thousands of Tons.*)

District.	Furnaces in blast.	Hematite.	Basic.	Foundry and forge.	Ferro-alloys.	Total.
Derbys, Leics, Notts, Northants, and Essex	20	—	27.9	20.5	—	48.4
Lancs (excl. N.-W. Coast), Denbighs, Flints, and Ches.	7	—	23.2	—	1.4	24.6
Yorkshire (excl. N.-E. Coast and Sheffield)	—	—	—	—	—	—
Lincolnshire	10	—	46.6	—	—	46.6
North-East Coast	18	2.6	63.9	—	1.3	67.8
Scotland	7	1.0	25.2	1.2	—	27.4
Staffs, Shrops, Worcs, and Warwicks	5	—	10.0	0.9	—	10.9
South Wales and Monmouthshire	10	3.5	50.2	—	—	53.7
Sheffield	2	—	3.5	—	—	3.5
North-West Coast	8	17.3	—	1.0	1.2	19.5
Total	87	24.4	250.5	23.6	3.9	302.4
January, 1961	87	25.7	257.1	22.2	3.5	308.5
February, 1960	83	21.7	249.0	28.7	2.1	301.5

TABLE 3.—*Weekly Average Deliveries of New Non-alloy and Alloy Finished Steel.* (*Thousands of Tons.*)

Product.	1959.	1960.	1960.		1961.
			Jan.	Dec.	Jan.
Non-alloy Steel:					
Ingots, blooms, billets, and slabs‡	5.1	5.6	6.6	5.2	5.7
Heavy rails	6.8	8.7	6.9	8.6	8.9
Sleepers	0.6	0.8	0.5	1.0	0.2
Fishplates and soleplates	0.4	0.6	0.4	0.7	0.6
Plates, 3 mm. thick and over:					
(i) Over ⅜ in. thick	24.8	30.9	29.2	35.2	36.2
(ii) Under ⅜ in.	18.3	22.0	20.0	22.8	26.6
Other heavy prod.	41.2	53.1	55.6	51.4	58.9
Ferro-concrete bars	9.6	12.0	12.1	11.3	13.8
Wire rods	23.5	28.6	29.4	28.2	29.8
Arches, etc.	7.8	7.9	7.7	6.6	7.8
Other light sections	33.0	41.3	42.1	39.7	44.5
Bright steel bars	7.6	9.7	9.8	8.3	10.0
Hot-rolled strip	27.4	33.1	34.9	29.8	30.3
Cold-rolled strip	8.0	10.0	10.0	9.1	9.7
Sheets, incl. coated:					
(i) Hot rolled	11.8	12.9	12.4	10.2	12.9
(ii) Cold reduced	35.2	40.6	39.8	35.8	40.8
Tinplate:					
(i) Hot dipped	7.7	8.0	7.5	5.7	6.6
(ii) Electrolytic	13.2	14.4	15.2	11.8	15.2
Blackplate	0.7	0.9	0.7	0.7	0.8
Tubes up to 16 in.	20.6	23.8	25.7	22.9	20.7
Tube fittings, etc.	0.4	0.4	0.4	0.4	0.4
Tyres, wheels, and axles	2.4	2.4	2.7	2.3	2.0
Forgings (ex. drop)	2.1	2.2	2.1	2.5	2.4
Steel castings	3.6	4.3	4.2	4.6	4.5
Tool steel	0.2	0.2	0.3	0.3	0.2
Total	312.0	374.4	376.2	355.1	389.5
Alloy steel	18.2	22.5	23.1	22.3	23.1
Total deliveries from U.K. prod.†	330.2	396.9	399.3	377.4	412.6
Add: Imported finished steel	7.1	19.1	12.1	11.2	6.9
	337.3	416.0	411.4	388.6	419.5
Deduct: Intra-industry conversion§	47.6	56.4	58.2	49.3	56.8
Total new material	289.7	359.6	353.2	339.3	362.7

† Includes finished steel made from imported ingots and semis.
‡ Other than for conversion into any other form of steel listed.
§ Material for conversion into other products also listed in this table.

TABLE 2.—*Weekly Average Production of Steel Ingots and Castings in February, 1961.* (*Thousands of Tons.*)

District.	Open-hearth.		Bessemer and LD.	Electric	All other.	Total.		Total ingots and castings.
	Acid.	Basic.				Ingots.	Steel for castings.	
Derbys, Leics, Notts, Northants, and Essex	—	4.8	14.3 (basic)	2.6	0.1	20.3	1.5	21.8
Lancs (excl. N.-W. Coast), Denbighs, Flints, and Ches	0.8	38.8	—	5.6	0.4	44.2	1.4	44.2
Yorkshire (excl. N.-E. Coast and Sheffield)								1.4
Lincolnshire	—	52.8	—	—	0.1	52.8	0.1	52.9
North-East Coast	0.9	92.7	—	1.8	0.5	93.7	2.2	95.9
Scotland	1.1	54.0	—	4.0	—	56.8	2.3	59.1
Staffs, Shrops, Worcs, and Warwicks	—	28.0	—	4.3	0.9	31.0	2.2	33.2
South Wales and Monmouthshire	2.3	86.4	18.8 (basic)	0.9	0.1	108.0	0.5	108.5
Sheffield (incl. small tonnage in Manchester)	8.1	39.4	—	14.8	0.4	60.7	2.0	62.7
North-West Coast	0.1	—	4.7 (acid)	0.8	—	5.4	0.2	5.6
Total	13.3	396.9	37.8	34.8	2.5	472.9	12.4	485.3
January, 1961	14.0	389.5	40.1	32.5	2.3	466.8	11.6	478.4
February, 1960	14.1	392.1	39.5	34.3	2.2	470.4	11.8	482.2

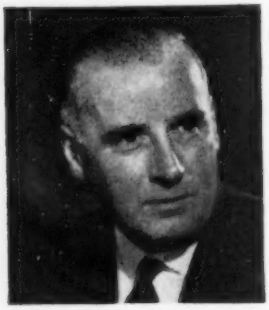
TABLE 4.—*Iron and Steel Index and General Summary of Pig-iron and Steel Production.* (*Weekly Average in Thousands of Tons.*)

Period.	B.o.T. Price Index, 1938 = 100.			Iron-ore output.	Imported ore used.	Coke sent to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	Iron and steel.	Coal.††	Basic materials§						Imports.†	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.‡
1959	340	486	477	286	244	210	242	208	7	388	291	2,244
1960	339	493	482	329	319	264	303	243	24	467	361	2,702
1960—Nov.*	339	525	474	344	337	279	315	266	20	505	370	2,686
Dec.	339	525	472	325	336	272	306	232	18	451	340	2,702
1961—Jan.	339	526	472	351	327	272	308	248	14	478	364	2,739
Feb.	339	526	476	354	325	265	302	254	11	485	365	2,773

* Months contain five weeks, all tables.
† Weekly average of calendar month.
‡ Stocks, ingots, semi-finished and finished steel, at the end of the years and months shown.
†† The index for coal is now based on prices ruling on the last day of each month.
§ Used in non-food manufacturing industries.

From Croydon to Llanelly

SPEAKING at Llanelly on Wednesday, Mr. H. E. Collins, National Coal Board member for production and reconstruction, emphasized the importance the board attached to mechanization, and said that although the total national output had been reduced the power-loaded output had been increased and there were now over 500 mechanized units producing coal on two shifts per day and 80 producing coal on three shifts per day.



MR. H. E. COLLINS

Mr. Collins was replying for the guests at a luncheon following the official opening of the new factory of Crawley Industrial Products, Limited, a member of the Ayling Industries Group. The company, he said, was providing a service to the mining industry, not only in the manufacture of standard items of plant, but also in the development of new machines. Its Midget Miner was a typical example, offering as it did one solution to the problem of mining thinner seams.

A prototype of a machine which would enable a conveyor belt to be turned through 90 deg. had been constructed. "I must admit to being guilty of having been concerned with the early stages of the design of the machine," said Mr. Collins and he looked forward with confidence to the underground trials which were to begin later this year.

The official opening of the factory was performed by Mr. Niall Macpherson, Parliamentary Secretary, Board of Trade. The company, he said, had had the courage and vision to emigrate from its old home at Croydon to Llanelly with its long tradition of working in coal, tinplate, and steel.

Lower Summer Coal Prices

LOWER summer prices to coal merchants will be introduced on May 1 and will operate until October 31, states the National Coal Board. During this period, the current winter price of the bulk of supplies to the domestic market will be reduced by £1 per ton. The reduction will apply to all grouped house coal, to Warmco, and to some Welsh boiler fuels.

The current winter price for certain superior quality Welsh boiler fuels will be reduced by 10s. per ton. This will apply to anthracite stove nuts, anthracite stovesse nuts, anthracite pea nuts and to anthracite peas, beans, and grains (except 1C, 2B, and 2C grains), and to dry steam medium and small nuts and Phurnacite.

There will be a reduction in the price of Sunbrite similar to that offered by other hard coke producers. The scheme does not apply to Scottish anthracite.

UNIT MECHANICAL ENGINEER at Pleasley Colliery (Notts) for the past 13 years, Mr. Raymond Morris is leaving due to ill-health to take up a post at the headquarters of the No. 2 Area of the East Midlands Division of the NCB.

In Parliament

Research Spending by NCB "Ridiculously Low"

TOLD by MR. JOHN C. GEORGE, Parliamentary Secretary to the Minister of Power, that the amount spent this year by the National Coal Board on research and development was about 0.6 per cent. of total expenditure, MR. DAVID GINSBURG (Lab.), asserted that this figure was "ridiculously low." In the chemical industry, he said, the proportion spent on scientific research represented 4.8 per cent. of the net output of the industry.

MR. GEORGE, while admitting that the proportion was lower than that for manufacturing industry generally, said that a comparison of the expenditure on research between extractive and manufacturing industries was extremely difficult. The NCB had increased its total expenditure on research from £3,300,000 in 1959 to £5,000,000 in 1961, and was very ready to increase it further if new possibilities of promise could be identified. The Minister of Power, he said, was in constant consultation with the Minister of Science on the question of research.

COAL IN HYDROGEN PRODUCTION

RECENT decision by Imperial Chemical Industries, Limited, to produce hydrogen from light oils instead of from coke, as at present, was raised by MR. DAVID GINSBURG (Lab.). The decision, he said, was likely to cost the National Coal Board a market for 600,000 tons of coal, and he asked if the Minister of Power was satisfied that the NCB went to the limit in trying to retain this important market.

MR. JOHN C. GEORGE, Parliamentary Secretary to the Minister of Power, said the use of coal as a source of power ought not to be confused with its use as an industrial raw material. The change in this case affected coal as a raw material, and he thought there would be no wish to dictate to a private company what its industrial raw materials should be.

MANPOWER IN COAL INDUSTRY

ASKED by MR. HAROLD NEAL (Lab.), about shortage of manpower in the coal industry and what steps were being taken to stop wastage, MR. JOHN C. GEORGE, Parliamentary Secretary to the Minister of Power, said in a written reply that there were vacancies for juveniles, skilled craftsmen and, especially in the Midlands, Yorkshire, and South Wales, for underground workers generally. To arrest wastage and encourage recruitment, the NCB was taking vigorous steps to inspire confidence in the industry's future.

MR. GEORGE said that the provisional figure for recruitment of juveniles into the industry for the first quarter of 1961 was 3,400, compared with 2,872 in the first quarter of 1960.

SINCE THE beginning of the year no liquid methane had been imported into the UK, the Parliamentary Secretary to the Minister of Power told Mr. Albert Roberts (Lab.). Regarding future possible imports, final proposals by the Gas Council were awaited by the Minister.

TELEPHONE NUMBER of the National Coal Board headquarters at Hobart House, Grosvenor Place, London, S.W.1, is now BELgravia 2020.

IRON AND STEEL TRADE

ROLLING mills are now working to schedules which permit steel firms to guarantee delivery of heavy beams, sections, and joists within the current quarter, and although orders for medium plate and sections are slightly stronger, current specifications can be met in a matter of weeks, compared with months in 1960. This does not mean that consumption is falling to any appreciable extent, but the balance has shifted a little towards the manufacturer of industrial plant, equipment, and machine tools, and away from building of new factories.

Pig-iron

The blast furnaces continue to provide consumers of pig-iron with adequate supplies and deliveries could be increased if the demand warranted larger tonnages. One or two brands of low phosphorus irons and hematite are not too easy to come by as production is limited, but other brands of equal analysis and quality are available to make good the deficiencies.

The steelworks continue to absorb large tonnages of basic pig-iron and, in some areas, this trade has recently shown signs of expanding. However, overall productive capacity is sufficient to satisfy any normal improvement in demand.

Ferro-alloys

Ferro-tungsten is unchanged in price and demand remains much the same. Ferro-molybdenum is fairly active, and there is a steady request for ferro-vanadium. Both the 75 per cent. Si and 45 per cent. Si grades of ferro-silicon are receiving moderate support, and ferro-chrome remains active.

Interest in ferro-niobium and ferro-titanium is maintained and silicon metal is in steady request.

Semi-finished Steel

Most of the re-rollers are obtaining reasonably good outputs of small bars and light sections, but generally they are not heavily committed as business is still restricted to a certain extent. The demand for strip and bright drawn bars is also well below previous levels, but there has been no falling off in the call for reinforcing rods and bars.

Fairly good stocks of mild steel billets are held, including a fair proportion of imported material, and the demand on home steelworks is much smaller than could be met without difficulty. All arisings of suitable defectives and crops are taken up.

Finished Steel

With many more sizes of sections and joists appearing on the rolling programmes, it is not now necessary to book as far ahead as has been the case in the past. Output of plain, chequered, and floor plates is fairly normal and makers are going all out to step up production, especially from the new plant now being run in.

Orders for bright drawn bars in good commercial quality can still be placed for reasonable delivery, but free cutting and special alloy qualities are still scarce owing to the difficulty in getting the necessary raw material. Demand for colliery requirements is still restrained with no immediate signs of improvement.

ENGLISH ABRASIVES CORPORATION, LIMITED, London, N.W.17—The dividend is to be increased by 2 per cent. to 10 per cent. for 1960. Trading profit rose to £204,814 (£156,778).

Test Rolling of Universal Beams at Colvilles' New Mill

UNIVERSAL rolling mill costing £2,500,000 built by the Lanarkshire Steel Company, Limited, a member of the Colvilles, Limited, group, is expected to be test-rolling within the next few weeks universal steel beams, claimed to be the biggest advance in beam design in 50 years. With important changes taking place in the market for rolled steel joists, it is claimed that universal beams will probably have the field to themselves within the next few years, because of the saving they offer in weight and construction costs. They are expected to be on sale before the end of the year.

Because the universal beam has flanges of equal thickness compared with the tapering flange of the normal beam, large sizes cannot be rolled on existing mills. The new Colvilles mill, which uses four rolls instead of the conventional two, overcomes this difficulty and will produce beams up to 24 in. by 6 in.

Iron and Steel Merchants Can Help Exports

PART which iron and steel merchants could play in helping to increase exports was not fully appreciated, it was stated at the annual meeting of the National Federation of Iron and Steel Merchants, held in London last week. Merchants had most valuable contacts with, and a great deal of experience in, oversea markets and with more encouragement could make a greater contribution to the export drive, it was emphasized.

The independent chairman, Mr. W. H. Lawson, referred to the 11th annual meeting of the International Federation of Associations of Steel, Tubes, and Metal Merchants, which is to be held in London from May 10 to 12. The federation is composed of national groups of merchants in ordinary and special steels, tubes, and non-ferrous metals, and its aim is to maintain frequent contact and to organize common action for the representation and protection of members' interests.

BIRMINGHAM RAILWAY CARRIAGE & WAGON COMPANY, LIMITED—Balance of revenue reserve of £929,013 has been set aside to provide for losses which are expected to be incurred on uncompleted contracts and for the cost of the cancellation of the London Transport Executive contract. Group loss for 1960 is £255,151 (net profit of £71,508). There is no dividend for this year, against 7½ per cent. less tax and a tax-free capital distribution of 5 per cent.

Coalfield News

We are "Cinderellas" say Winding Enginemen

IT was alleged at a meeting of 150 colliery winding enginemen in County Durham last Saturday, that enginemen's wages and conditions had deteriorated due to the deliberate policy of the National Union of Mineworkers to disregard winding enginemen. They described themselves as "Cinderellas of the coal industry." A resolution was approved to set up a branch in Durham of the "rebel" National Union of Winding Enginemen. It was stated that there were 3,300 enginemen in Britain and if the NUWE could get the support of 1,800 of these, it would be able to apply to the National Coal Board for recognition as a negotiating body.

Mr. A. Kay, general secretary of the Durham Enginemen's Association, which is part of the NUM, opposing the formation of a breakaway union, said that a national meeting was to be held on May 2 to consider the position of winding enginemen, their wages and conditions.

SHIPMENTS OF COAL and coke from the South Wales ports last week improved to 55,678 tons, a gain of 3,772 tons on the previous week, and of 6,442 tons on a year ago.

IN SPITE of Derbyshire County Council's campaign against open-cast mining, the Minister of Housing and Local Government has decided to allow Robinson & McGing, Limited, to open up a new site at Sitwell Grange Lane, Pilsley (Derbyshire).

COAL SHIPMENTS from Blyth (Northumberland) during March totalled 597,957 tons, compared with 540,514 tons last year. The total for the first quarter of the year was 1,946,548 tons, an increase of 320,204 tons on a year ago. Foreign shipments amounted to 199,354 tons, compared with 175,294.

AFTER A ROOF fall at Newdigate Colliery, Bedworth (Warwickshire), last week, rescue teams worked for 20 hours to recover the body of Mr. George Thomas Thornton, a packer, who was killed by the fall. Mr. Henry Szyszka, a conveyor worker, was rescued after seven hours, and escaped with cuts and shock.

TEAM FROM Whitwick Colliery, Coalville, East Midlands Division, won the senior section of the 13th annual NCB first-aid competition at Blackpool last Saturday. Grimethorpe Colliery, Barnsley (Yorks), North-Eastern Division, won the junior section. The coke ovens and ancillary workers' competition was won by Tursdale central workshops, Durham Division.

AFTER BEING asked for its observations from a planning position, Llandilo (Carmarthen) Rural District Council has objected to a National Coal Board proposal to carry out open-cast mining at Penybanc because the village is near Pantyffynon and Wernos Collieries and with additional open-cast development, it would be surrounded by coal-tips. The council has previously opposed open-cast mining operations in its district.

CONTENDING THAT the density of dust in the power-loading sections at Frances Colliery, Dysart (Fifeshire), is higher than it should be, miners have asked the Coal Board to get rid of the dust or the shearer-loaders. The board is giving the matter major attention and a higher pressure pump, which has only recently come on to the market, is being installed in one of the districts to give water injections ahead of the working face.

Coal Chartering

THERE is still a strong demand on Japanese account for coal, and having regard to size of tonnage and loading position, rates continue to advance. Hampton Roads/Tobata paid $7.60 for a 25,000 tonner, July 15/August 15, and a 22,000 tonner has been taken for a few consecutive voyages at $7.40 within July/September. For July 20/August 31 cancelling 8,000 tons has been fixed at $9.50 and 17,000 tons for July 1/20 at $8.95. For second half May loading, however, a 14,500 tonner secured the firm rate of $10.85 and 15,000 tons for May 20/June 10 $10.50.

As far as Brazil is concerned, there is some fluctuation in rates and whereas 15,500 tons for May 10/30 was fixed to Rio de Janeiro at $7.00 with steamer discharging, 9,500 tons for May 10/25 was secured at $6.50 and Mobile/Santos paid $7.50 for 6,200 tons for May loading. Nothing has been reported to the Lower Plate. Other Hampton Roads coal fixtures include 7,800 tons to Lisbon at $5.10 for May loading with free discharge, and a 15,000 tonner to Yugoslavia also May at $5.35, again free discharging.

Handy size tonnage has been fixed from Gdansk to Cork at 20s. f.i.o. and trimmed for early loading, and charterers are interested in further tonnage and might be able to arrange a few consecutive voyages. Generally speaking there is only a reasonable demand from the Continent to Mediterranean destinations. The UK coal situation to the Mediterranean is dull and charterers are in no way pressing for tonnage.

Miners' Boxing Finals at Wolverhampton

FOUR of the contestants at next Friday's national finals of the mineworkers' national amateur boxing championships, to be held at the Civic Hall, Wolverhampton, are also finalists in the ABA championships at Wembley tonight (Friday). Two of them —bantamweight Billy Williams (West Midlands Division) and light-heavyweight J. G. Bodell (East Midlands Division)—are also the present holders of the NCBABA national titles in their respective weights and will be defending their titles at Wolverhampton.

The other two ABA finalists are middleweight Stuart Price (South-Western Division) and light-welterweight Pat O'Rourke (North-Eastern Division). A third man to defend his NCBABA title at Wolverhampton will be light-welterweight Geoff Rees (South-Western Division).

Wolverhampton will see the winners from the recent northern and southern semi-finals in the ring. In the northern semi-finals at Hamilton five boxers from the Scottish Division and five from the North-Eastern Division shared the honours, while in the southern semi-finals at Neath there were five successful contestants from the South-Western Division, three from the East Midlands, and two from the West Midlands. Two special contests will complete the programme.

The tournament will start at 7.30 p.m., after a programme of music by the Arley Welfare Band. The national trophies will be presented after each contest by the chairman of the National Coal Board, Mr. Alfred Robens.

STANTON IRONWORKS COMPANY, LIMITED—Mr. W. N. Menzies-Wilson has been elected a director.

THE COAL TRADE

IF the present lull in the coal trade is the "calm before the storm" merchants will not mind so much, as, so far as the domestic trade is concerned, in most areas it can only improve. Stocks have been reduced to a level that will just about supply urgent needs before new supplies against summer prices are received and even some of the good resolutions made in the winter to obtain and hold as much anthracite as possible have gone by the board.

DERBYSHIRE

The household trade is at rock bottom this week. A number of merchants are holding a certain tonnage of coals to meet urgent needs next week after the introduction of summer prices and before fresh supplies have been received. All qualities of coal are freely obtainable, but only limited tonnages can be accepted. Domestic coke nuts are, similarly, in much reduced demand and domestic grades of anthracite are in limited request. Phurnacite is also easy to obtain, although here also there may be some delay before many merchants receive consignments at summer prices.

Industrial requirements are fairly steady, and normal for the time of the year. Nutty slacks continue to flow satisfactorily, while dry screened nuts are in fair supply and current demand is being met without undue difficulty. Washed fuels are in good demand, although there is a reduced pressure compared with earlier weeks. Hard steam coals are in moderate request and plentiful supplies are available. Little interest is apparent in all grades of hard and gas coke, and the small number of orders received has prompt attention.

LEICESTERSHIRE

The trade continues slow, although orders are now being placed for supplies when the summer prices become effective. All grades of coal are in plentiful supply, and the new premium smokeless fuels are promptly despatched. Gas coke of all sizes continues in good supply, with prompt despatch by rail.

There is little change in the central heating market. Industry generally is being served by accumulated supplies, which are of no great volume as the weather has considerably improved. The industrial fuel market remains steady, with supplies very much easier than they have been for some months. All grades of D.S. nuts, beans and grains remain in strong demand. Stocks which have been held for some time at production points now appear to have been lifted, and have been of great value.

Dominion Steel & Coal Income Declines

BECAUSE income declined during the five months ended December 31, 1960, directors of the Dominion Steel & Coal Corporation, Limited (Dosco), Montreal, Canada, feel that a policy of concentrating upon improved operating efficiency rather than upon expansion is justified. The company, which is controlled by A. V. Roe Canada, Limited, and is a member of the Hawker Siddeley Group, Limited, had a net income for the five months period of $495,192 against the previous year's balance of $3,475,816.

Two cash dividends of 10 cents each were declared during the period, being at the annual rate of 40 cents per share and dividends, after retained earnings, now total $46,830,000 ($46,930,000).

Revival in Coal Productivity

ALTHOUGH there was a slight drop in coal output last week, productivity, which had fallen to below the 80-cwt. mark at the face, returned to 82.34 cwt., with 28.72 cwt. overall. What is probably the beginning of a gradual increase in coal stocks began in the week ended April 15, when the total rose from 23,012,000 tons to 23,075,000 tons. As might be expected in the weeks immediately prior to summer prices consumers' stocks at 11,891,000 tons are almost static.

There were 577,520 wage-earners on colliery books on April 15, against 611,800 on April 16, 1960, the numbers engaged at the coal face being 216,460 and 234,940 respectively. Total absenteeism (all workers) in the week ended April 15, was 13.50 per cent., compared with 15.83 per cent. in the week ended April 16, 1960. Output at the face was 4.117 tons and overall 1.436 tons in the week ended April 15, compared with 3.988 and 1.410 tons in the week ended April 16, 1960.

The following table gives (in tons) the revised output of saleable mined coal by division in the week ended April 22, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

Division.	Week ended April 22, 1961.		Week ended April 30, 1960.*
	Total output.	Tonnage lost.	Total output.
Scottish	358,000	8,000	369,000
Northern (N&C) ..	249,000	1,000	243,000
Durham	466,000	—	456,000
North-Eastern ..	836,000	23,000	862,000
North-Western ..	247,000	2,000	276,000
East Midlands ..	896,000	—	921,000
West Midlands ..	282,000	1,000	296,000
South-Western ..	367,000	14,000	396,000
South-Eastern ..	28,000	—	32,000
Great Britain—			
Deep-mined coal ..	3,729,000	49,000	3,851,000
Other deep-mined (including licensed mines) ..	42,000	—	47,000
Open-cast coal ..	184,000	—	164,000
TOTAL	3,955,000	49,000	4,062,000

* Comparable week last year.

DECISION TO close the sheet and metal platework departments at the Springburn, Glasgow, works of Frederick Braby & Company, Limited, will make redundant about 300 men, slightly more than half the present labour force. Employees discharged will be given compensation and those willing to transfer will be offered work at the group's other factories in England. Neither departments was operating at a profit, said Mr. J. S. Chandler, secretary of the company.

Personal

Institute of Fuel's Next President

NEXT president of the Institute of Fuel will be Dr. JAMES BURNS, present vice-president of the Institute, and deputy chairman of the North Thames Gas Board. He will take up office, in succession to Dr. Angus Macfarlane, next October. At the institute's annual luncheon in London last week it was also announced that Dr. A. C. DUNNINGHAM had been elected an honorary member in recognition of his contribution to the work of the institute over a number of years. There are only four other living honorary members.

Winners of the institute's Bone-Wheeler Medal were also announced by the president. They are Dr. G. F. EVESON and Dr. S. C. SINGHAL, both of Birmingham University, whose papers were judged to have been of equal merit.

Mr. TOM TAYLOR, undermanager at Ferrymoor Colliery, Barnsley (Yorks), has retired after 50 years' service in the mines.

Production engineer with the North West Gas Board, Mr. W. S. HUBBARD has been elected president of the Liverpool Engineering Society.

Mr. M. EYRE of Erco (Mining Developments), Limited, expects to be in Greece, Turkey, and Iraq during May to pursue exports of British machinery.

Recently appointed oversea director on the main board of Imperial Chemical Industries, Limited, Mr. M. J. S. CLAPHAM has agreed to continue for a further term as president of the Institute of Industrial Supervisors.

Presentation has been made by the staff of George Hattersley & Sons, Limited, textile machinery manufacturers, of Keighley (Yorks), to Col. F. LONGDEN-SMITH, chairman, on the completion of his 50 years' service with the company.

Assistant managing director (oversea) of the British Aluminium Company, Limited, Mr. G. W. LACEY has been elected president of the Aluminium Development Association for 1961-62 in succession to Mr. W. Brining, who has been appointed vice-president.

Chairman of the Western Hemisphere Exports Council, Lord ROOTES began the first stage of a five-week tour of the USA, Canada, and the West Indies when he arrived in New York on Sunday. His trip is the latest move by the WHEC (formerly the Dollar Exports Council), in its new campaign to boost exports to the Western Hemisphere.

Chairman and managing director of Baird & Tatlock (London), Limited, a director of Hopkin & Williams, Limited, and W. B. Nicolson (Scientific Instruments), Limited, Mr. J. E. C. BAILEY is on a visit to the US and Canada to continue discussions with American associates on the further developments in the "Analmatic" range of process control instruments.

The George Medal has been awarded to Mr. JAMES DICKINSON APPLEBY, a miner at Whittle Colliery, near Alnwick (Northumberland) for his attempt to rescue four children from a burning house near his own home in Alnwick. He received multiple burns and was in hospital for eight weeks. He has already received a Royal Humane Society award for bravery.

Formerly director of the Royal College of Science and Technology, Glasgow, the honorary degree of LL.D. is to be conferred on Sir DAVID ANDERSON at Glasgow University on Commemoration Day, June 21. A similar degree will also be conferred on Sir KENNETH HAGUE, chairman of Babcock & Wilcox, Limited, engineers, boiler house equipment manufacturers, etc., of London, N.W.1.

Deputy managing director of the Delta Metal Company, Limited, and managing director of James Booth Aluminium Company, Limited, Mr. W. J. VAUGHTON left yesterday (Thursday) for Rio de Janeiro on the first leg of his tour of 11 countries. He will visit Brazil, Peru, Venezuela, Canada, United States, Japan, Hongkong, Thailand, India, Kenya, and South Africa. This will be the fifth sales promotion tour undertaken by Mr. Vaughton.

Three members of the staff of Stanley Works (G.B.), Limited, tool manufacturers, of Sheffield, left for the United States on Monday. They are Mr. ARTHUR JONES, general works manager; Mr. WILLIAM MILLS, general sales manager; and Mr. HUGH DUNCOMBE, production engineer, who will discuss production, marketing and management techniques with executives of the Stanley Works, New Britain, Connecticut, the parent company of the Stanley organization.

In succession to Sir Harry Jephcott, who has held the office since its formation in 1956, Sir HAROLD ROXBEE COX (58), has been appointed chairman of the Council for Scientific and Industrial Research for five years from October 1. An engineer by profession, Sir Harold has spent more than 20 years in Government service and has done pioneer work on jet propulsion, gas turbines, and problems of fuel and power. For six years he was chief scientist, Ministry of Fuel and Power. Leaving Government service in 1954, he became associated with a number of industrial companies, including the Metal Box Company, Limited. In January this year Sir Harold assumed chairmanship of the company.

Changes in Management of English Steel

MANY new appointments among its subsidiary companies has been announced by the English Steel Corporation, Limited, Sheffield. The English Steel Spring Corporation, Limited, has appointed Mr. J. P. HODGES as manager of the Grimesthorpe spring works. The following have accepted appointments with the English Steel Rolling Mills Corporation, Limited, at its Tinsley Park development: Mr. J. B. MACHIN, works manager; Mr. R. B. SIMPSON, assistant works manager; Mr. E. PINDER, manager, steel melting department; Mr. E. SANDERSON, manager, blooming and billet mills; Mr. B. DYSON, manager, bar mills; Mr. J. SWALLOW, maintenance engineer

Other appointments are: Mr. W. E. J. STREET, cost accountant, English Steel Forge & Engineering Corporation, Limited; Mr. T. HOLLOWOOD, cost accountant, English Steel Spring Corporation; Mr. F. R. BARNES, assistant accountant, Darlington Forge, Limited; Mr. R. VOLLUM, cost accountant, powers and comptometer offices, responsible for machine accounting, development and maintenance; Mr. T. W. HOLLAND, assistant cost accountant, operating companies, and personal assistant to the chief accountant, operating companies; and Mr. J. THORP, assistant cost accountant, operating companies, responsible for capital expenditure.

COMPANY NEWS

BRIGGS COLLIERIES, LIMITED (in voluntary liquidation)—The liquidator proposes a fourth and final distribution of 1s. 2.55d. per share, payable June 1, bringing total amount distributed to 44s. 6.55d.

G. & J. WEIR HOLDINGS, LIMITED—Though the group net profit fell to £795,993 (£1,256,143) in 1960, the dividend is held at 18 per cent. on the £4,100,000 one-class capital, with an unchanged final of 12 per cent.

ELLIOTT-AUTOMATION, LIMITED—With a final of 8 per cent. for 1960, the dividend is being raised to 13 (9¼ equivalent) per cent. Group profits attributable to Elliott-Automation expanded to £2,269,500 (£1,363,187).

JAMES CHESTERMAN & COMPANY, LIMITED, manufacturers of engineers' tools, etc., of Sheffield—Final dividend of 10 per cent. for 1960 makes 14 (12½) per cent. for the year. Net profit amounted to £36,291 (£31,173) after tax of £46,500 (£28,500).

WM. SANDERS & COMPANY (WEDNESBURY), LIMITED, makers of electrical switch and fuse gear, of Wednesbury (Staffs)—Dividend of 30 (25) per cent. is recommended for 1960. Profits of £42,202 (£35,908) are subject to tax of £20,763 (£17,718).

CAMMELL LAIRD & COMPANY, LIMITED, holding company of shipbuilders and engineers, of Birkenhead (Ches)—Group profit for 1960 rose to £811,834 (£427,192) and the dividend is effectively increased to 12 (7) per cent. with a final of 9 per cent.

MATTHEW HALL & COMPANY, LIMITED—Group net profit of £200,761 compares with £252,231, after tax of £180,000 (£234,000). The dividend is raised from the equivalent of 18½ per cent. to 20 per cent. for 1960, and in addition a capital dividend of 5 per cent. tax free is announced.

LAURENCE SCOTT & ELECTROMOTORS, LIMITED—Trading profits fell from £1,122,674 to £872,167 in 1960. The final dividend is maintained at 10 per cent., making an unchanged 15 per cent. total. After tax of £300,000 (£410,000), the net balance is £310,719, against £415,322.

J. & H. B. JACKSON, LIMITED, metal merchants, of Coventry (Warwicks)—Acceptance of the revised offer for the ordinary capital of Brett's Stamping Company, Limited, is recommended by Brett's directors. The offer is 15s. in cash, plus eight Jackson 1s. ordinary, for each Brett's £1 share.

WILLIAMS & WILLIAMS, LIMITED, makers of metal windows, doors, etc., of Chester—Although reorganization is proceeding on a satisfactory basis, the directors have decided to defer payment of the preference dividend for the half-year ended April 30, 1961. The dividend is in arrears from November 2, 1959.

NEWMAN TUBES, LIMITED, weldless steel tube manufacturers, of Wednesbury (Staffs)—Dividend is being raised to 25 (20) per cent. for the year to January 31, 1961. Net trading profit increased to £160,016 (£155,729) but after a higher tax charge of £74,784 (£64,983) the available balance is lower at £85,232 (£90,746).

CAPE ASBESTOS COMPANY, LIMITED, Barking (Essex)—Group profits for 1960 increased to £1,859,029 (£1,581,436). Following the unchanged 5 per cent. interim dividend, the final, which is payable on capital increased by the £1,250,000 5s. shares issued on the acquisition of Small & Parkes, Limited, is raised to 17½ (15) per cent.

A.P.V. COMPANY, LIMITED, dairy, brewery, chemical and general engineers, of Crawley (Sussex)—The current year's trading has started satisfactorily and Mr. W. E. Jenkins, the chairman, attributes the improvement in results to an increase of 11 per cent. in group turnover, at £7,100,000, to greater productivity and to increased efficiency in all departments.

ENFIELD ROLLING MILLS, LIMITED, refiners and rollers of non-ferrous metals—Group pre-tax profits for 1960 fell to £1,192,780 (£1,685,432), but holders are told that the board felt justified in maintaining the dividend at 15 per cent. Although below that of the beginning of last year, activity is still at a good level and appears to be increasing, says the Earl of Verulam, the chairman.

TUBE INVESTMENTS, LIMITED—Interim of 7 per cent. is being paid on £35,431,313 for the year to July 31, 1961. For 1959-60 there was an 8½ per cent. interim on £16,828,702, followed by a final of 9¾ per cent. on £35,008,573. The current declaration is intended to eliminate the disparity between payments, and does not imply any increase in the total distribution for the year, it is stated.

HOPKINSONS, LIMITED, bronze, iron and steel founders, of Huddersfield—Group profits for the year to January 31, 1961, amounted to £1,056,792 compared with £1,095,923, and the net balance, after tax, to £544,092 (£575,423). The balance attributable to the company is £539,558 (£570,200). Total dividend is raised by 5 per cent. to 27½ per cent. with a final of 17½ per cent.

B. ELLIOTT & COMPANY, LIMITED, holding company for machine-tool manufacturers, of London, N.W.10—The share capital of Broadway Equipment, Limited, has been acquired. Broadway Equipment is sole licensee for the UK and a number of Commonwealth countries of the French range of brake presses manufactured by Promecam of Paris, and is also sole agent for a number of other foreign machine tools.

CEMENTATION COMPANY, LIMITED—The group will probably show a net loss, after tax, for the year to March 31, 1961, states the new chairman, Sir Frederick Pile, and he cannot hold out any hope of an ordinary dividend for the year. No ordinary payment was made for 1959-60, compared with 12½ per cent. for each of the five preceeding years. Steps are being taken, however, to reconstitute the group's management structure and to improve the company's financial position, it is added.

BAKER PERKINS, LIMITED, engineers, and iron, steel and brass founders, etc., of Peterborough—Group profit, before tax, for 1960 was £1,193,201, compared with £771,526, and a final dividend of 8¾ per cent. is being paid, making 11¼ per cent. for 1960, compared with the equivalent of 8 per cent. for 1959, adjusting for a one-for-four scrip issue. Net profit attributable to Baker Perkins was £530,042 (£417,924). The directors recommend an increase of £2,000,000 in the authorized ordinary capital.

RICHARD CRITTALL & COMPANY, LIMITED, heating, ventilating and air conditioning engineers, of London, W.1.—Mr. G. C. R. Eley, the chairman, states that the company has entered 1961 with a higher forward order-book and, in addition, trading conditions have improved. An extra-ordinary meeting will follow the annual meeting May 19, to consider converting the undertaking into an industrial holding company, called Richard Crittall Holdings, Limited, and to bring the articles up to date.

JOHN THOMPSON, LIMITED—Although detailed group

figures will not be available until towards the end of May the directors consider holders should know there was a substantial loss incurred in 1960 and consequently they are unlikely to recommend a final dividend. An interim of 5 per cent. was paid last November and a total of 20 per cent. for 1959 included a final of 12½ per cent. The order-book is in a "very healthy state" and in the absence of any unforeseen events, the board believe the group will show encouraging profits in the future.

SWAN, HUNTER, & WIGHAM RICHARDSON, LIMITED, ship builders and repairers, of Wallsend (Northumberland)—Mr. John Hunter, the chairman, states that the 10 per cent. dividend of the past two years may be maintained for some years to come. This decision has been made, he explains, in view of the comparatively conservative dividend policy of the past and the declining need for capital expenditure. Group net profit for 1960 was £1,419,005 (£1,344,033). In addition to the dividend, holders this time are to receive a bonus of 2 (nil) per cent.

CRAVEN BROS. (MANCHESTER), LIMITED—Keen competition has lowered profit margins, but Mr. James Lauchlan, the chairman, reports that the amount of orders on hand is very satisfactory. He adds that it is hoped to overcome shortage of skilled craftsmen by training their own apprentices. Members are also informed that at no time have the directors been approached on the matter of take-over and Mr. Lauchlan thinks it most improbable that an "aggressive bid" would be contemplated by anyone for such a highly specialized business.

ABERDARE CABLES (HOLDINGS), LIMITED—Sir John Pascoe, the chairman, says that the expansion of turnover of the subsidiary company, South Wales Switchgear, Limited, has been largely responsible for the group's satisfactory 1960 results in face of the falling profits on the cable side of the business. In spite of the unremunerative price level of the year to October 31, 1960, the cables company operated at a profit, and an increased contribution is expected during 1961. Group profit, after tax, is £331,554 (£367,332) and the dividend is held at 17½ per cent.

1,000,000 Tons of Pig-iron from Hand-charged Blast Furnace

MORE than 1,000,000 tons of high-grade hematite pig-iron has been produced by an eight-year-old blast furnace during a period of continuous operation at the works of the Millom Hematite Ore & Iron Company, Limited, Millom (Cumberland). During the period, the furnace consumed 813,142 tons of coke and 1,800,000 tons of ores and other materials. This involved the filling, pulling, hoisting, and emptying of more than 5,000,000 barrows.

The furnace, a comparatively small one with a 14-ft. hearth diameter, is hand charged, and is one of three at the company's 94-year-old works. A spokesman for the firm said that very few blast furnaces in England, even modern large units, had passed the 1,000,000-ton mark for a single campaign.

The tonnage was achieved in the production of hematite pig-iron, of which more than 80 per cent. was above 2 per cent. silicon. The furnace was blown in on April 11, 1953, and is due to be closed down for re-lining at the end of this month. On May 3 a new blast furnace, completed recently at a cost of about £500,000, will be lit at Millom Hematite's works.

Record Home and Export Sales by ICI

RECORD exports worth £96,600,000 f.o.b. are reported by Imperial Chemical Industries, Limited, for 1960—a 10 per cent. increase over 1959. Sales outside the UK of chemicals produced by subsidiaries oversea, states Mr. S. P. Chambers, chairman, are now about equal to the oversea sales of products manufactured in the UK.

MR. S. P. CHAMBERS

The group's total oversea sales of £255,000,000 now approach in value the total home sales of the group. As previously reported, external group sales were £50,000,00 higher at £558,400,000. Sales in the home market were 9 per cent. higher and were the best ever. The sales volume was 11 per cent. higher, but as a result of further price reduction, home prices fell by about 2 per cent. overall, equivalent to a reduction result of further price reductions, home prices fell by about 2 per cent. overall, equivalent to a reduction of about £5,000,000 in income. Nearly all divisions shared in the increased business.

In 1960, £34,000,000 was expended under the UK construction programme, compared with £32,000,000 in the previous year and with £45,000,000 in 1958. At end-1960 the number of UK employees was 113,699, compared with 109,596 a year earlier, and under the profit-sharing scheme 93,229 employees qualified for a total bonus in respect of 1959 of £7,305,956 gross, or £5,522,989 net after personal tax, averaging £78 7s. 4d. gross, or £59 4s. 10d. net per employee.

Wellman—Incandescent Heat Merger Plans

MERGER of the Incandescent Heat Company, Limited, and its subsidiaries with the Wellman Smith Owen Engineering Corporation, Limited, group has now taken effect, and although it is the intention that the Incandescent group shall continue to operate as an autonomous unit, the future close co-operation between the two groups should be mutually beneficial, as their products are mainly complementary.

Both construct furnaces for the metallurgical industries, but whereas Wellman specialize more on the larger melting furnaces and oxygen steelmaking processes, including the heavy-duty mechanical equipment, the Incandescent group's activities are, in the main, concentrated on the finishing processes of steel and non-ferrous products such as annealing and heat-treatment furnaces, embodying a wide range of thermal engineering throughout the metallurgical, chemical, foundry, ceramic, and other industries.

In the export field for integrated steel plants, the two companies with their joint resources will be in a position to undertake the whole of the furnace work from steel melting including electric furnaces down to the smallest finishing and heat treatment units.

Board Changes

Keith Blackman Makes Executive Changes

AT the end of next month, Mr. D. S. Woodley will retire from the office of managing director of KEITH BLACKMAN, LIMITED, fan engineers and industrial gas equipment manufacturers, etc., of London N.17, but will remain the company's chairman and also act as consultant.

He will be succeeded as managing director by Mr. F. W. Goodge, one of the present joint assistant managing directors, who has been appointed to the board and will take over his duties on June 1. Mr. C. J. Atkins will become assistant managing director from the same date.

TITANIC STEEL COMPANY, LIMITED—Mr. T. Richmond has been appointed to the board of the company, a subsidiary of Samuel Osborn & Company, Limited.

R. D. NICOL & COMPANY, LIMITED—Mr. G. G. Thompson has been appointed to the board. He is a director of the parent company, Staveley Industries, Limited.

LANCASHIRE DYNAMO, LIMITED—Mr. P. Huggins has been appointed to the board of the company, and also to that of Crypto, Limited, both companies in the Metal Industries, Limited, group.

ORMEROD SHAPERS, LIMITED—Mr. G. W. Wright, Mr. J. Blakiston and Mr. M. Wood have been appointed to the board of the company, a subsidiary of the Asquith Machine Tool Corporation, Limited.

FORGROVE MACHINERY COMPANY, LIMITED—Mr. John Horn, works director, is relinquishing his executive duties with the company, but for another two years he will remain on the board in an advisory capacity.

BRITISH INDUSTRIAL GASES, LIMITED—Mr. W. E. Hughes has been appointed director and general manager of the company, a subsidiary of the British Oxygen Company, Limited. He succeeds Mr. F. Blackmore, who is now manager of the parent company's equipment development technical division.

METROPOLITAN-CAMMELL CARRIAGE & WAGON COMPANY, LIMITED—Sir Ralph B. Emmerson is to become chairman in succession to Mr. H. N. Edwards, who is resigning from the position on April 30. Mr. Edwards, who has been with the company or its predecessors for 51 years, will continue as a director. Mr. A. H. Hird will join the board in place of Sir James Reid Young, who is retiring on April 30.

New £5,000,000 German Rolling Mill

AT a cost of over £5,000,000 the West German steel company Gussstahlwerk Witten, AG, of Witten, is to erect a rolling mill to replace an existing unit dating from 1911. The unit, a combined sheet and wire rolling mill, will come into operation in the spring of 1963 with a monthly production of 5,000 metric tons of wire and 1,000 tons of sheet. Siemens-Martin and L.-D. furnaces will increase steel production necessary for the operation of the new mill.

In the financial year ended September 30, Witten produced 225,000 tons of raw steel, the same amount of semi-finished products, 130,000 tons of bar steel, and 45,000 tons of rolled wire, reaching a record turnover of DM 275,000,000.

Fellowship for Leading Fuel Scientist

DIRECTOR-GENERAL of the British Coal Utilisation Research Association, and well-known research scientist, author, and lecturer, Dr. D. T. A. Townend has been elected a Fellow of the Imperial College of Science and Technology, London University.

DR. D. T. A. TOWNEND

A former student and Research Fellow of the Royal College of Science, Dr. Townend is one of the leading authorities on higher hydro-carbons. He went to BCURA in 1945 from Leeds University where he was Livesey Professor of Coal, Gas and Fuel Industries. He became, in 1958, the first British recipient of the Gold Medal of the Institut Français des Combustibles et de l'Energie, which is awarded for outstanding scientific achievement in the field of utilization of fuel and power.

Also elected to fellowship of the college are Prof. O. M. B. Bulman, FRS, Woodwardian Professor of Geology, University of Cambridge, and a former student and member of the staff of the Royal College of Science; and Dr. J. H. Watson, chief assayer, Royal Mint, hon. secretary and treasurer, Royal School of Mines Association, and a former student of the Royal School of Mines.

Plant Extensions Planned at Balfour Steelworks

PLANS to install a 3½-ton arc furnace of the most modern design, to join the 3-ton furnace already there, are under consideration by Arthur Balfour & Company, Limited, tool steel engineers, of Sheffield. The scheme envisages the extension of the shop at the Greenland Road works by 170 ft. and the provision of facilities for scrap storage, casting and soaking pits, over-head cranes, ladle heating and slag material drying. There are also plans to extend the billet processing shop to allow space for a further six high-speed steel grinding machines, additional sawing equipment and improved billet stocking facilities.

The annealing department also has facilities for three additional furnaces, and extension plans are being considered. The first stage of the new chemical analysis and metallurgical laboratories is almost complete. These, which will serve all departments of the Balfour group, are to be named after Mr. A. R. Hawkes, chief chemist, who has been with the company for 43 years.

CLAIM FOR DAMAGES against Newton Chambers & Company, Limited, by William Staniforth (66), labourer, who alleged negligence by the firm as a result of which he trapped his fingers when removing a box from a stack, was dismissed at Sheffield County Court. Costs were awarded to the firm.

Orders Placed

TANGYES, LIMITED, is to supply four Hydraflo pumps for use in the Dutch state mines. The order is worth £11,000. The pumps will be used for deep hole infusion to saturate coal faces with water to reduce latent dust and minimize the risk of coal face workers contracting pneumoconiosis.

DIESEL GENERATING PLANT worth over £250,000 is to be supplied by Mirrlees Bickerton & Day, Limited, for the Government of the Argentine province of Santa Fé. Four 12-cylinder engines with turbochargers are to be supplied direct coupled to Brush alternators, for installation at two power stations.

THE Ontario Hydro-Electric Commission has placed a contract worth about $,1,800,000 for coal with the Dominion Steel & Coal Corporation, Limited, a subsidiary of Avro, Canada, Limited. The 200,000 tons of coal will be used for large-scale testing at the commission's thermal electric generating stations.

ORDER WORTH about £73,000 has been placed by Sudan Railways with the Metropolitan-Cammell Carriage & Wagon Company, Limited, for 23 carriage under-frames complete with bogies, wheels and axles. Delivery is to be made later this year and follows a previous order for 35 frames which are nearing completion.

MECHANICAL, HYDRAULIC and electrical engineers of Bedford, W. H. Allen, Sons & Company, Limited, has received an order from the Lummus Company, Limited, London, W.1, for the supply of a 750 kW diesel-alternator set for a synthetic rubber plant being built at Bareilly, India, the complete installation of which is being handled by the Lummus company.

BRITISH FURNACES, LIMITED, Chesterfield, has received orders for gas carburizing equipment to be installed at the Scotstoun factory of Albion Motors, Limited. The orders cover four super Allcase sealed quench furnaces, with fully automatic sequence control, together with ancillary equipment. The plant will provide completely up-to-date final heat treatment for transmission gears.

TWO IMPORTANT ORDERS have been received by the English Steel Spring Corporation, Limited, a subsidiary of the English Steel Corporation, Limited. One, for the London Midland Region of British Railways, is worth £70,000, and is for the supply of laminated springs for locomotives. The other is a 12-months contract with the International Harvester Company of Gt. Britain, Limited, for the supply of three different types of coil springs for use in tractors being made by the company.

CONTRACT HAS BEEN awarded to Braithwaite & Company Structural, Limited, to supply and erect 3,000 tons of structural steelwork for the new bar mill at Tinsley Park, Sheffield, of the English Steel Rolling Mills Corporation, Limited. Braithwaite & Company (Engineers), Limited, the parent, has supplied 650 pressed steel tanks and about 250 cubic tanks for water storage with a capacity of 5,000,000 gal., together with steelwork for supporting structures, for the Gazira Board (Development Scheme) in the Sudan.

REPEAT ORDER, worth over £50,000, has been received by the General Electric Company, Limited, from the East Rand Engineering Company of Johannesburg for equipment to be used in the conversion of a winder from steam to electric drive. As in the previous order this winder will be installed underground at the Withok mine of the S.A. Lands & Exploration Company, Limited, of the Anglo-American Corporation, Limited. Winding engine business totalling £355,000 has been placed with GEC during the past year for equipment for installation in Rhodesia and South Africa.

New Appointments at Steel, Peech & Tozer

THE following appointments by Steel, Peech & Tozer, a branch of the United Steel Companies, Limited, become effective on Monday:—

Mr. C. H. Hayter, at present works manager (Templeborough), will become works manager (Ickles departments and bar mills); Mr. R. Scholey, work manager (Ickles), is to be works manager (flat products); Mr. R. S. Howes, manager of the "Spear" project, will become works manager (steelmaking and primary mills); Mr. P. Beynon, at present works manager (operational research and work study), is to be personnel manager; Dr. B. B. Hundy, chief research metallurgist, is to become chief metallurgist; Mr. W. Ash, at present chief works metallurgist, will become deputy chief metallurgist; Mr. H. A. Longden, assistant chief works metallurgist, is to be works metallurgist, and Mr. M. Thomas, works manager (services), will become general services manager.

Output at Inco's New Manitoba Project

PRODUCTION at the rate of 75,000,000 lb. of nickel a year is expected to be reached "in a matter of weeks" at the new Thompson nickel project in Manitoba of the International Nickel Company of Canada, Limited, Mr. Henry S. Wingate, chairman, told the annual meeting of shareholders in Toronto last week. The new enterprise, formally dedicated about a month ago, was a "very valuable addition" to the company's assets, to Canada, and to nickel users everywhere in terms of assurance of reliability of nickel supplies.

Mr. Wingate said it could be expected that the Thompson project would have an important effect on the company's prospects, because of the extension it gave to the life of the company and the additional nickel it enabled it to produce. With regard to 1961, he said that there were indications that the looked-for improvement in US demand for nickel had started. First quarter of 1961 earnings should compare "not unfavourably" with the $18,000,000 or 62 cents a common share for the last quarter of 1960.

ADVANCE IN KRUPP GROUP TURNOVER

WITH a group turnover of DM 5,064,000,000 for 1960, Fried. Krupp, the German iron, steel, coal, and engineering concern showed an improvement of almost 16 per cent. over the previous year. This was reported by Herr Alfried Krupp, owner of the company, at a recent ceremony celebrating employees' long service anniversaries. The company reaches its 150th anniversary in a few months' time.

Herr Krupp said the revaluation of the D-mark was bound to result in difficulties for the business. Although most export prices were based on D-mark price and in theory were not affected by revaluation, a number of foreign customers were not prepared to bear the consequence of the revaluation themselves, and the company was faced with a series of difficult negotiations. The effect of revaluation on the group's future business would be even more noticeable, and it would be hardly possible to maintain export prices.

NEWS IN BRIEF

FROM MAY 23 the London address of the Consolidated Zinc Corporation, Limited, and its associated companies, will be changed to 6, St. James's Square, S.W.1 (telephone: WHItehall 5411). The registered and transfer offices will still be 9, Basinghall Street, E.C.

TELEPHONE NUMBER of the information office of the Shipbuilding Conference, the Shipbuilding Employers' Federation, the Dry Dock Owners & Repairers Central Council, and the National Association of Marine Engine Builders, has been changed to BELgravia 5131/5.

SUB-LICENCE has been granted by Albright & Wilson (Manufacturing), Limited, to Fescol, Limited, electro depositors and engineers, of London, N.7, for the operation of the Kanigen electroless nickel-plating process. Fescol is planning to build the necessary plant at its works at Brownhills (Staffs).

TRAINING SCHEME among blast-furnace workers at the Park Gate Iron & Steel Company, Limited, Rotherham, has cut the blast-furnace accident rate by more than half in a year, reports Mr. E. A. Cotterill, blast furnace superintendent with the company, in Safety, the accident prevention magazine.

THE 25½ TONS of steelwork used in the construction of the two-floor pavilion of the Vickers group at the British Trade Fair in Moscow, has been supplied by the Palmers Hebburn works of Vickers-Armstrongs (Shipbuilders), Limited. Largest pavilion of a single group in the Fair, it has a floor area of 7,400 sq. ft.

A SCHOOL for training engineers in the use of electronic equipment has been established by Associated Electrical Industries, Limited, at New Parks, Leicester, headquarters of its electronic apparatus division. Trainees include not only members of the company's construction department but also customers' engineers.

BECAUSE THE development by the National Coal Board of a new high-grade smokeless fuel may make unnecessary the spending of about £475,000 on the adaptation and conversion of grates, Greenock (Renfrew) Town Council has decided to shelve for six months its plan to make the burgh a smokeless zone in stages over the next 10 years.

TO CO-OPERATE "in the furtherance of their respective businesses," the boards of Mountstuart Dry Docks, Limited, and the Prince of Wales Dry Dock Company Swansea, Limited, announces that a committee, with equal representation from each company, has been formed. The announcement refers to co-operation and does not suggest a merger betwen the two companies.

A RECORD NUMBER of delegates is expected at the joint annual conference of the Coil Spring Federation and its research organization to be held at the Palace Hotel, Torquay from May 11-14. The programme includes a technical session at which Mr. R. A. Varo will present a research paper dealing with the static mechanical properties of British, Swedish, and German spring wires.

COMPOSITION OF the Divisional Committee No. 1—insulating materials—of the Electrical Research Association, includes:—Dr. L. G. Brazier, chairman, who is a director of British Insulated Callender's Cables, Limited, Mr. R. F. Archer, managing director of the Micanite & Insulators Company, Limited, Mr. V. J. Francis, General Electric Company, Limited, Mr. W. Reddish, Imperial Chemical Industries, Limited, Mr. E. H. Reynolds, British Insulated Callender's Cables, Limited, and Mr. G. H. Thornley, a director of Castrol Industrial, Limited.

NEW SCHOOL at Leeds is to be named the Matthew Murray Comprehensive School after Matthew Murray, who, in 1789, went to Leeds and, with partners, built the Round Foundry. Later he invented a locomotive capable of hauling 100 tons of coal at three miles an hour. He was also an inventor of machine tools, including a planing machine, which he brought out in 1814.

FITTED WITH solid fuel central heating by the Coal Utilisation Council, a demonstration house in Newport (Mon), was, on Monday, opened to the public for a month by television personality, Mrs. Olive Stephens. Mr. Lionel Evans, chairman of the South Wales region of the CUC and Dr. W. E. Harris, deputy marketing director of the South-Western Divisional Coal Board, also attended the ceremony.

A PARTY OF 80 MEMBERS of the East Midlands Association of the Institution of Civil Engineers spent a day at the works of the Stanton Ironworks Company, Limited, near Nottingham, last week. During their tour, the visitors saw large diameter spun iron pipes in course of manufacture and the production of prestressed concrete pressure pipes. One of the company's mechanized foundries was also visited.

ENFIELD ROLLING MILLS, LIMITED, Standard Telephones & Cables, Limited, and Tube Investments, Limited, have concluded negotiations under which Mersey Cable Works, Limited, at present wholly owned by TI will transfer its plant, goodwill, and business to Enfield-Standard Power Cables, Limited, from May, in exchange for shares in Enfield-Standard. Production will continue and no redundancy is foreseen at the Mersey works.

FIFTEEN JUNIOR employees of the Staveley Iron & Chemical Company, Limited, are making a five-day tour next week of works in the Scottish group of Stewarts and Lloyds, Limited, of which Staveley Iron is now a member. The party will be led by Mr. A. G. G. Isaacs, recently-appointed general manager, services, and will consist of young men representing many skills and crafts, accompanied by members of the training department staff.

Tempory Shut-down at RTB's Abercarn Tinplate Works

TEMPORARY closure of the Richard Thomas & Baldwins, Limited, tinplate works at Abercarn (Mon), which uses the hot-dip method of tinning, was announced this week. The company hopes to resume work there when the demand for tinplate revives, but in the meantime is pressing ahead with the installation of its second electrolytic tinning line at Ebbw Vale, which should be completed later this summer.

Earlier this year the Steel Company of Wales, Limited, the largest tinplate producer, closed down its Burry works which also used the hot-dip method. Over-stocking in the canning industry, which takes 90 per cent. of Britain's tinplate output, forced producers to reduce their output, but there has been a slow revival in recent weeks.

Gas-cleaning Plant at Appleby-Frodingham

WITHIN the next 12 months the Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited, will have a gas-cleaning system as good as any in the world. This was told to members of the Scunthorpe Borough Council by the technical adviser on steelmaking to the United Steel Companies, Mr. Albert Jackson, before an extended tour of the Appleby-Frodingham steelmaking units to see what was being done to stop atmospheric pollution in relation to the Ajax oxygen steelmaking process.

In the next year, Mr. Jackson revealed, the Scunthorpe firm would have six Ajax furnaces in operation, all of which would be equipped with the most modern and efficient chimneys and cleaning units, and within two years the company, which now has four Ajax units, expects to have eight in production. Mr. Jackson said that the additional units would come into operation as the necessary iron and oxygen supplies became available under the current expansion programme.

Tracing the history of gas cleaning at the steelworks and the extensive anti-pollution methods introduced in the Ajax process, Mr. Jackson said that the original imported gas cleaner had had many teething troubles and a considerable amount of development work had taken place before it became reasonably satisfactory as a gas-cleaning plant. " Its throughput capacity was found to be much less than expected and the size of the original unit was doubled. It was subsequently found, however, that even this was insufficient, and capital and operating costs were very much higher than had appeared likely in the first place.

" Two British companies approached us shortly after this original fume cleaner was put into operation and asked if they could set up, at our works, a small testing laboratory so that they could experiment on methods of fume collection, which, it was hoped, they would be able to apply by modifications to their existing gas-cleaning plant."

When the time came to order the second Ajax furnace, he went on, after the first had been operating quite a number of months to prove its satisfaction, the British makers then said that they believed they could build a suitable gas cleaner which would be satisfactory to Appleby-Frodingham. Mr. Jackson added: " It can now be assumed that the third and fourth cleaners we installed give perfectly clean stacks, in fact much cleaner than any open-hearth furnace of any kind." They were relatively inexpensive and undoubtedly a tribute to the makers and designers and to the company which had faith in the ability of the British companies and invested money in a plant which was in an experimental stage.

Explosives Factories to Close

BECAUSE of a decline in the market for explosives and blasting equipment, the Earlstown and Hawkley Hill factories of the Colliery Explosives Company, Limited, are to be closed before the end of the year. About 140 workers will be affected. The announcement was made last week by Mr. L. Hall, chairman of the company and joint managing director of the Nobel division of the Imperial Chemical Industries, Limited.

Production costs have been increased by lessened demands in the UK and oversea and this has to be offset by more efficiency and concentration of production units.

Drive to Raise More Iron-ore in Lincolnshire

IRONSTONE miners in North-west Lincolnshire raised almost a third of the national output of ore last year to make the district the largest single contributor to the home ore development drive. Throughout the year stone was raised from workings in the area at the rate of more than 100,000 tons a week. Work has now started for the production of an extra 1,500,000 tons a year to meet the increased needs of the Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited. The Scunthorpe area's contribution to this increased tonnage will be produced from the Dragonby and Santon underground mines. Average weekly output from the Frodingham bed last year was 104,000 tons, a sharp rise on the 1959 level, and nearly three times that of 1938.

A good start was made in January this year when local mines produced from underground and open-cast workings an average of over 122,000 tons a week. The mines section of Richard Thomas & Baldwins, Limited, is now opening out new workings in the Winterton area, while John Lysaght's Scunthorpe Works, branch of G.K.N. Steel Company, Limited, is developing drift workings between Ferriby and Brigg. The ore mining branch of United Steel, which is already raising more than 5,500,000 tons a year, is investing heavily in capital equipment and extensions to its workings in North-west Lincolnshire, South Lincolnshire, and Rutland.

Work is progressing on the building of a £1,000,000 walking dragline excavator for the Roxby open-cast mine at Scunthorpe, and a giant American shovel excavator is being made for the Colsterworth North mine. At the new Easton mine, three drifts from the surface to underground workings have been completed, and the first production unit will be delivered there this month, giving the mine a weekly output of 3,000 tons.

Obituary

Senior partner in the firm of Forster, Raw & Partners, mining and civil engineers, of Newcastle-upon-Tyne, Mr. GEORGE RAW, has died at the age of 77.

Former managing director of J. & J. Charlesworth, Limited, colliery owners, coke and by-product manufacturers, of Wakefield (Yorks), Col. WILLIAM G. CHARLESWORTH has died at the age of 81.

For a number of years a director and company secretary of Plowright Bros., Limited, makers of coal preparation plant, mining equipment, etc., of Chesterfield, until he retired, Mr. GEORGE WILLIAM BOOCOCK has died at the age of 79.

Managing director of Deritend Engineering Company, Limited, which he founded in 1920, Mr. EDWIN LESLIE BISHOP has died at the age of 70. Mr. Bishop invented a rotary bending machine connected with the folding of cardboard and a machine used for feeding cardboard blanks.

Mr. THOMAS MITCHELL CAMERON, who has died at the age of 78, served for over 50 years with Alex. Findlay & Company, Limited, structural engineers, etc., of Motherwell (Lanarkshire). For almost half that period he was a director of the company. For his achievements as a draughtsman in connection with research work on the building of atomic power stations, Mr. Cameron was made an MBE some years ago.

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G26

Imports and Exports of Iron and Steel

FIGURES of imports and exports of iron and steel in March are given in the following tables, based on the Board of Trade returns, and including totals for the first three months of 1960 and 1961.

Total Exports of Iron and Steel

Destination.	Month ended Mar. 31.	Three months ended March 31.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Malta	954	2,186	1,518
Sierra Leone	435	1,245	4,064
Ghana	2,089	5,915	4,792
Nigeria	6,907	17,418	22,629
Union of South Africa	5,424	18,017	18,179
South-West Africa	1,036	1,296	5,265
Rhodesia and Nyasaland	4,532	5,620	10,956
Tanganyika	3,115	2,384	7,055
Kenya	4,093	4,947	11,139
Uganda	1,135	421	1,624
Mauritius	135	1,183	526
Bahrein, Qatar, and Trucial States	2,226	4,951	4,678
Kuwait	2,233	1,394	4,530
India	15,630	70,861	65,807
Pakistan	3,172	19,621	10,094
Singapore	2,011	4,331	6,502
Malaya	3,581	4,624	8,196
Ceylon	3,714	14,992	8,481
British North Borneo	302	1,282	838
Hongkong	5,649	18,001	16,076
Australia	14,451	41,704	52,431
New Zealand	24,894	24,557	80,518
Canada	6,949	55,367	29,288
Jamaica	1,774	7,378	5,350
Trinidad	1,975	11,899	9,081
British Guiana	785	1,916	2,243
Other Commonwealth countries	3,317	7,023	7,429
Eire	5,693	15,696	19,475
Soviet Union	1,928	7,206	7,393
Finland	6,131	9,028	13,828
Sweden	13,083	56,927	45,101
Norway	10,822	35,654	30,778
Denmark	7,654	26,961	24,067
Poland	1,184	3,279	3,704
Western Germany	7,314	49,051	23,631
Eastern Germany	2,778	8,848	6,088
Netherlands	12,472	37,938	31,464
Belgium	3,641	10,241	7,114
France	607	2,245	2,181
Switzerland	1,243	3,096	4,608
Portugal	2,060	3,914	6,184
Spain	1,643	9,101	4,774
Italy	6,887	12,202	17,012
Austria	511	1,350	1,488
Yugoslavia	6,457	5,565	11,550
Greece	2,568	4,087	10,794
Turkey	910	976	4,833
Netherlands Antilles	105	1,558	279
Portuguese East Africa	572	1,076	932
Egypt	6,904	6,180	12,020
Libya	800	2,084	2,305
Sudan	649	3,028	2,666
Israel	2,005	6,653	6,258
Saudi Arabia	84	148	313
Iraq	3,848	7,695	18,157
Iran	1,639	26,008	5,160
Burma	593	2,532	1,402
Thailand	556	2,359	1,757
Indonesia	320	7,970	2,084
China	2,118	17,386	7,790
Japan	9,024	27,431	30,901
Philippine Republic	163	2,604	1,059
USA	10,998	87,359	25,362
Cuba	159	2,542	650
Mexico	837	1,999	1,267
Colombia	976	2,710	3,970
Venezuela	3,049	11,881	5,888
Ecuador	188	600	781
Peru	206	1,902	1,619
Chile	411	651	1,059
Brazil	1,341	5,499	3,097
Uruguay	1,144	2,937	2,615
Argentina	10,785	26,702	27,768
Other foreign countries	4,877	20,602	19,645
TOTAL	282,455	933,994	862,160

Total Imports of Iron and Steel

From	Month ended March 31.	Three months ended March 31.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Union of South Africa	2,497	12,968	8,907
Rhodesia and Nyasaland	5,637	1,920	13,714
Canada	14,134	7,232	50,699
Other Commonwealth countries and Eire	633	9,726	10,903
Soviet Union	2,025	12,871	6,819
Sweden	4,829	11,802	14,394
Norway	9,830	33,427	32,188
Poland	197	6,620	418
Western Germany	2,962	43,802	11,108
Netherlands	12,697	44,494	27,783
Belgium	5,530	21,237	16,527
Luxembourg	2,856	2,938	8,848
France	1,879	15,099	7,510
Italy	17	4,027	225
Austria	826	3,318	1,633
Japan	663	1,967	2,391
USA	1,498	28,020	4,319
Other foreign countries	800	7,937	2,632
TOTAL	69,510	269,405	221,018
Iron and steel scrap and waste fit only for the recovery of metal	3,542	42,154	6,831

Exports of Iron and Steel by Product

Product.	Month ended March 31.	Three months ended March 31.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Pig-iron	6,037	58,695	23,364
Ferro-columbium (niobium)	1	40	8
Ferro-tungsten	77	323	252
Other ferro-alloys	248	2,443	964
Ingots, blooms, billets, slabs, sheet bars (incl. tinplate bars), and similar primary forms	3,944	17,795	8,367
Pieces roughly shaped by forging	239	476	579
Iron bars, rods, angles, shapes, and sections	233	434	606
Steel bars, rods, angles, sections, and shapes	63,734	167,733	185,746
Iron plates and sheets	288	304	515
Universal plates	1,274	5,540	3,308
Steel plate, 3 mm. and under 4.5 mm. thickness	4,015	8,981	9,689
Ditto, 4.5 mm. or more in thickness	26,541	92,749	85,429
Blacksheets and blackplate	30,541	82,900	86,676
Hoop and strip	12,797	25,520	34,719
Tinplate	36,710	147,585	114,136
Decorated tinplate	732	1,056	1,894
Galvanized sheets	6,731	18,249	19,739
Other (incl. tinned sheets, terneplate, and ternesheets)	3,329	8,857	10,131
Railway and tramway construction material	18,712	37,360	61,193
Wire rods of steel (incl. alloy steel)	3,480	16,606	13,257
Wire	11,527	32,634	34,828
Tubes, pipes, and fittings	51,265	208,714	166,760
TOTAL	282,455	933,994	862,160

AS ITS CONTRIBUTION to Commonwealth Technical Training Week, the Industrial Welfare Society is to hold a dinner for apprentices and past apprentices at the Café Royal, Regent Street, London, W.1, on May 30. Chairman of the Society, Capt. H. Leighton Davies, will preside, and speakers will include Sir David Eccles, Minister of Education, Sir Miles Thomas, chairman, Monsanto Chemicals, Limited, Sir Ben Lockspeiser, director and scientific adviser to the Tube Investments, Limited, group, and Mr. John March, director of the society.

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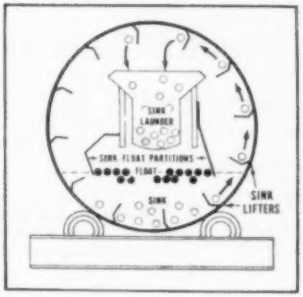

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Advertisements accompanied by a remittance and replies to Box Numbers should be addressed to the Advertisement Manager, Iron and Coal, John Adam House, 17/19, John Adam Street, London, W.C.2. If received by first post Tuesday, they can normally be accommodated in the next Friday's issue.

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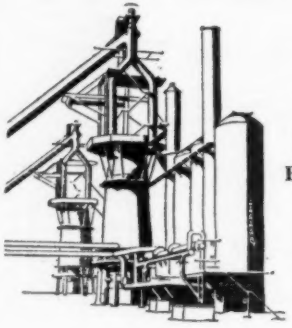

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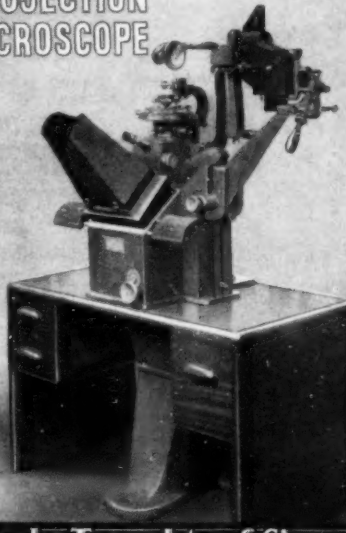

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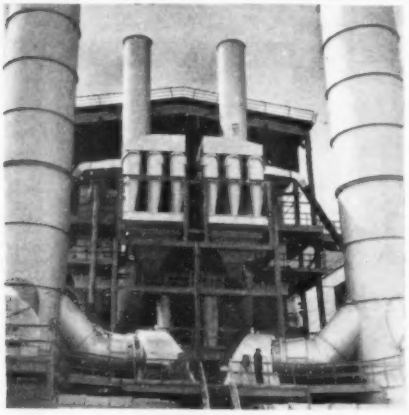

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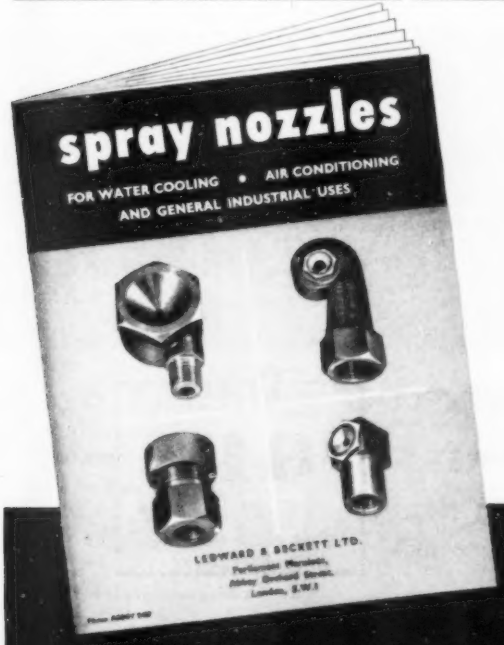

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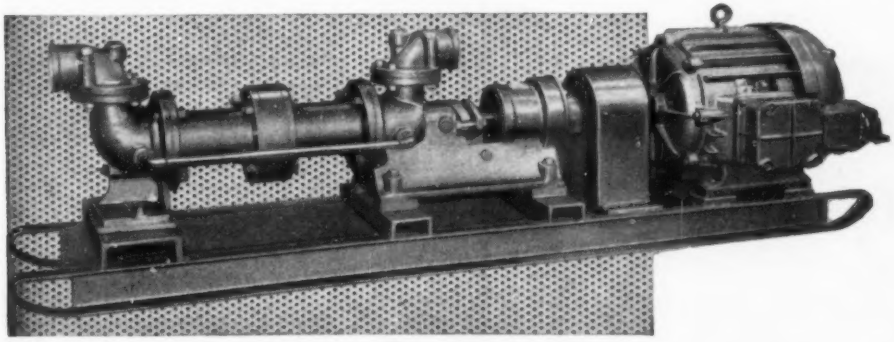

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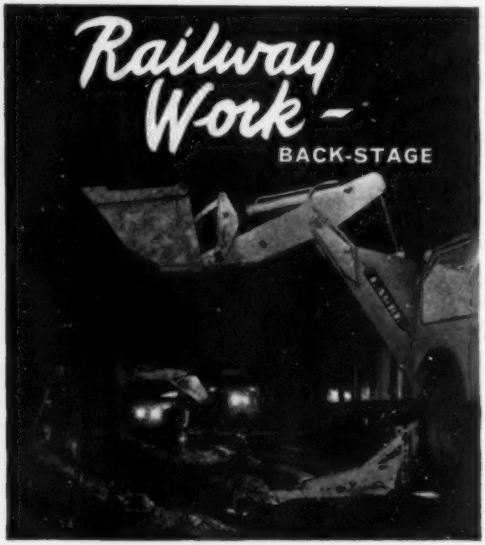

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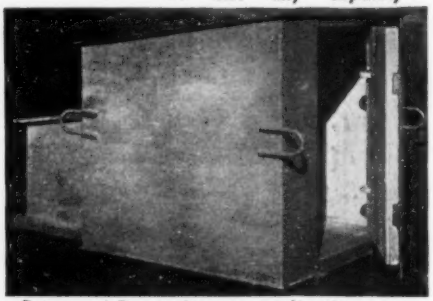

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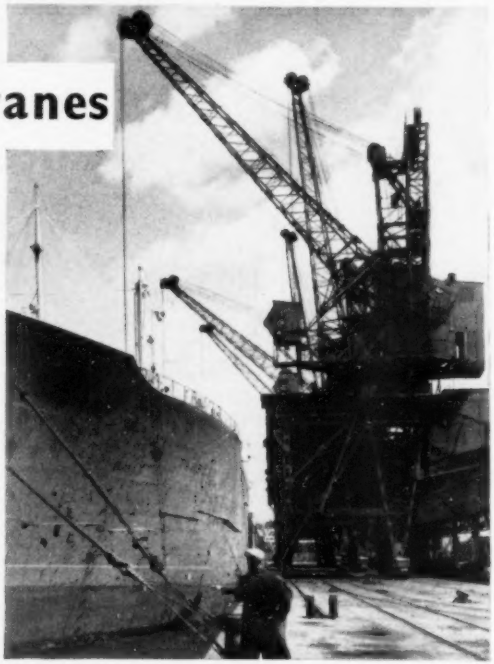

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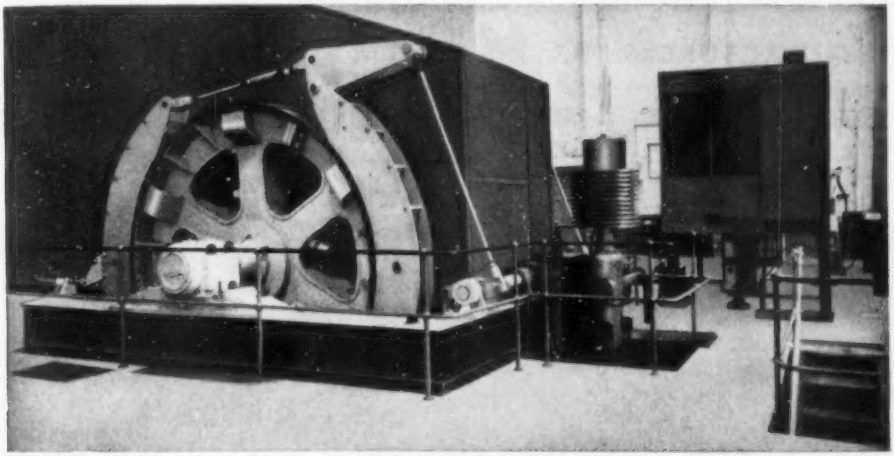

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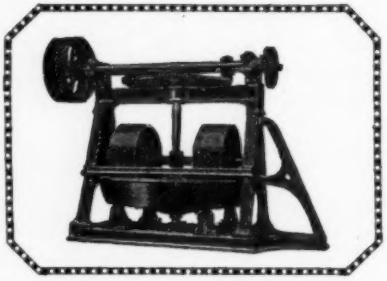

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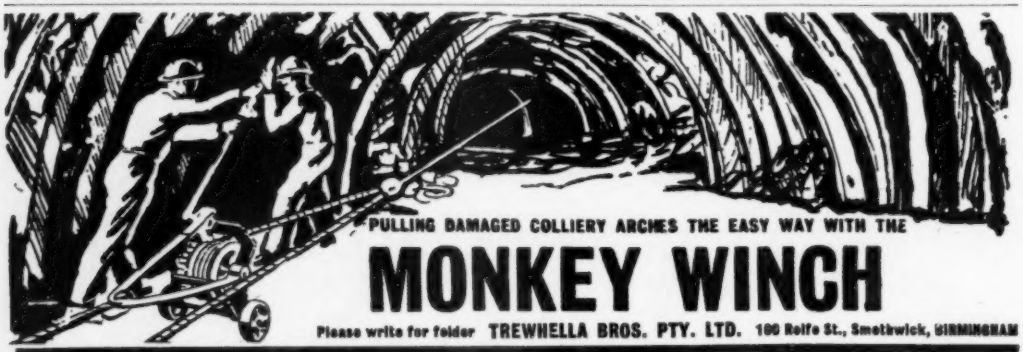

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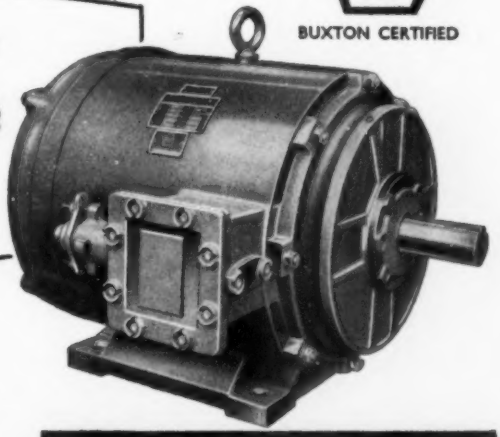

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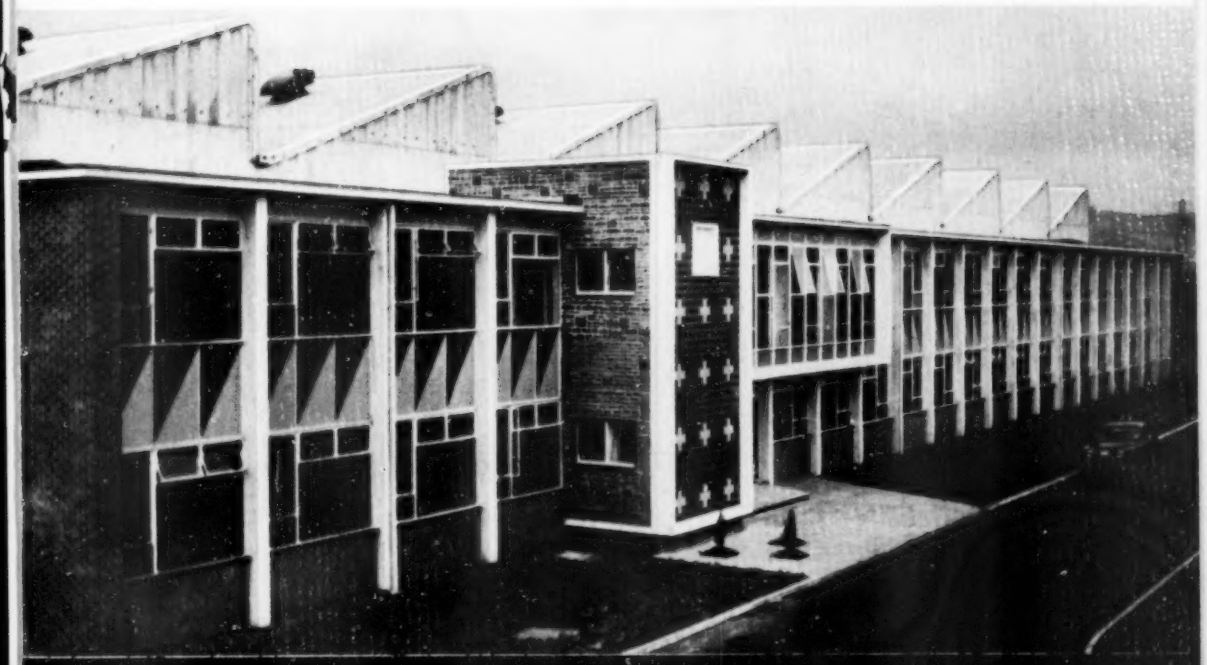


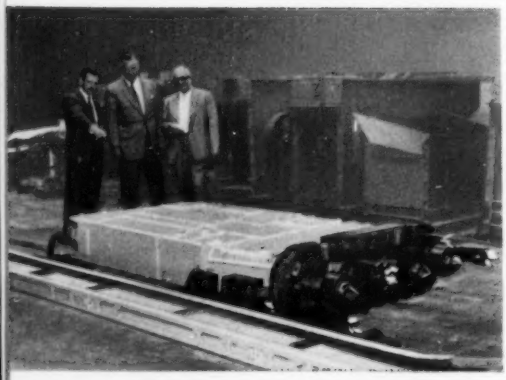
New factory at Llanelly covers nearly 100,000 sq. ft.
Official opening 26th April, 1961 by the Parliamentary Secretary to the Board of Trade.

CRAWLEY

Crawley thin seam mining equipment includes:—

CRAWLEY WILCOX CONTINUOUS MINERS · MOBILE BUNKER CONVEYORS
CRAWLEY MIDGET MINERS · MOBILE STAGE LOADERS
LO-HITE ARMOURED SNAKING CONVEYORS · MOBILE STAGE FEEDERS
HEAVY DUTY SNAKING CONVEYORS · EXTENSIBLE STAGE LOADERS
STATIONARY BUNKER CONVEYORS · EXTENSIBLE TUB LOADERS
MOBILE & EXTENSIBLE STAGE COAL BUNKER UNITS

THE CRAWLEY MIDGET MINER



Semi-Automatic Control

Can be fitted with sensing device consisting of gamma ray source which automatically adjusts vertical height of machine depending upon the relative thickness of coal and rock between the source and the receiver due to preferential scattering by rock as compared with coal.

Appreciation

1 The first practical thin seam miner.
2 The first thin seam miner under semi-automatic control.

Performance

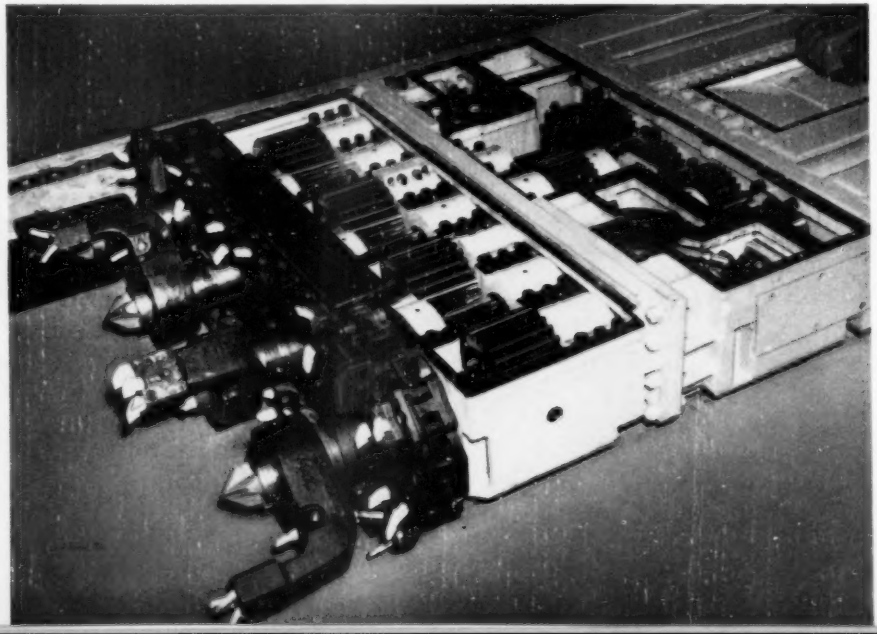
1 Seams 18in. to 30in.
2 Depth of cut 4ft. 6in. to 4ft. 9in.
3 200 tons per shift in 2ft. 6in. seam actually achieved.

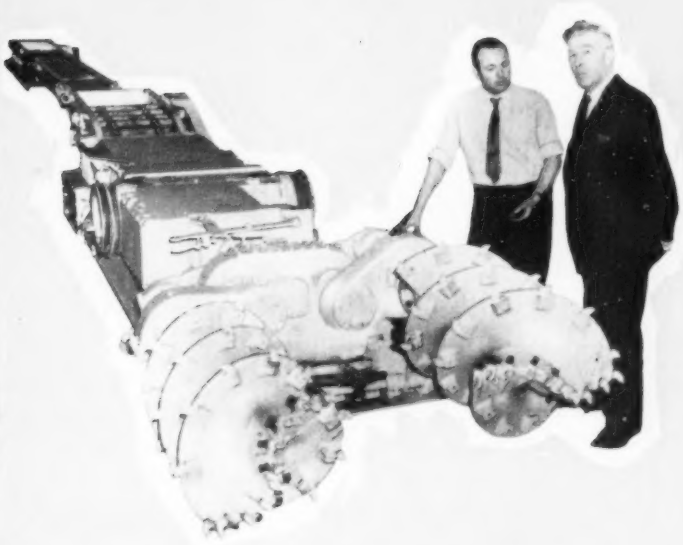
Specifications

1 Single-ended longwall cutting machine with four boring arms phased at an angle of 72° to each other.
2 Boring arms operated ahead of periphery chain clearing uncut and unloaded coal.
3 Chain includes flight picks bored to ensure complete coal loading.
4 Water jet dust suppression system.
5 Cutting height adjusted by fitting jib inserts.

Operation

1 As boring arms rotate coal passes from one arm to next until outer arm loads on to conveyor.
2 Peripheral side cutting chain clears the coal not loaded by trepanning arms and completes loading.





THE CRAWLEY-WILCOX CONTINUOUS MINER

Performance

1 Seams 22in. to 46in.

2 300 tons per shift in 36in. seam with two machines and eleven man crew.

Specification

1 Shortwall cutting machine with two augers, the diameters of which can be varied according to seam thickness.

2 Tungsten carbide cutting picks on front cutting edges and auger scrolls.

3 Flameproofed to British Standards.

Operation

1 Motor driven augers through reduction gearing rotating in opposite directions—forward oscillation prevents coal binding.

2 Hydraulic controls on machine and conveyor.

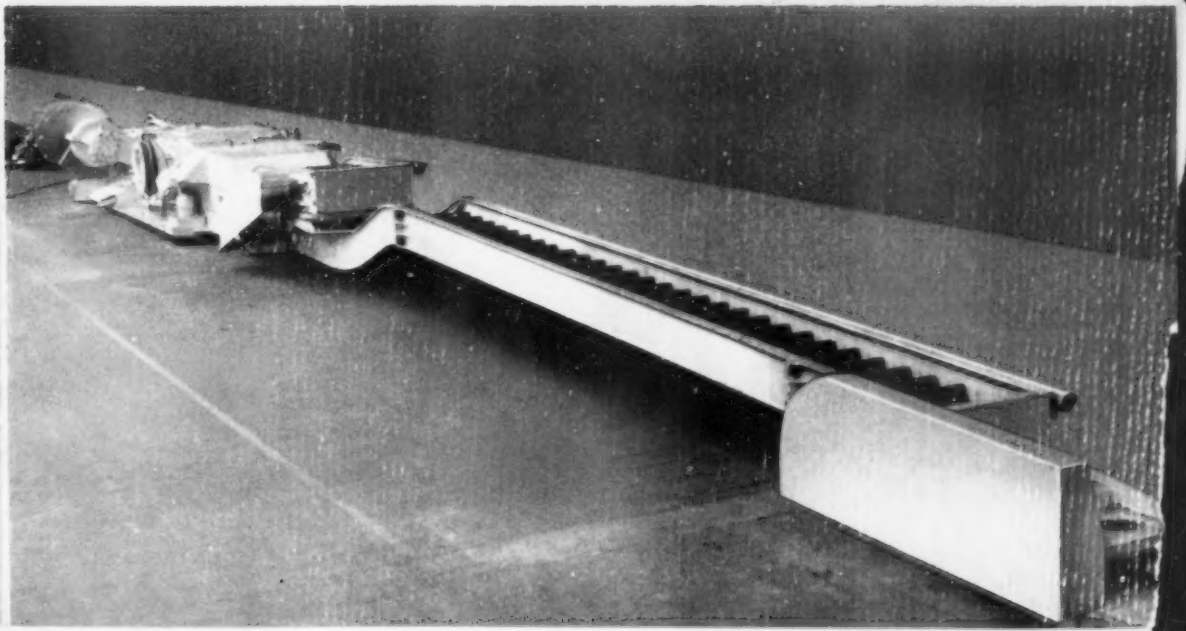
3 Coal discharges on to bridge conveyor and thence on to chain conveyor.

4 Bridge conveyor pivots at either end.

Appreciation

1 The lowest Continuous Miner on the market in height, cost and maintenance.

2 Operating in conditions where other equipment has failed.



THE MANAGEMENT TEAM AT CRAWLEY

Modern management is essentially the result of integrated team work at all executive and operative levels. Crawley Industrial Products Ltd. are well-known specialists in mining equipment, but in addition they are supported by a pool of knowledge and technical skill from the other member companies of the Ayling Group of Industries.
As a result of this team work within the Ayling Group each company can draw upon the resources of the group as well as its own experience, which means that in the end the service offered by each company to its customers is correspondingly increased.

Frank H. Ayling, Chairman

A. J. Bray, Director

Norman H. Dixon, General Manager

David Marr, Deputy General Manager

C. E. Locke, Accountant

Clifford Hugill, Sales Manager

D. Carley, Production Controller

A COMPLETE TECHNICAL SERVICE

For a number of years Crawley have concerned themselves exclusively with the design, production and application of mining equipment. Constantly it has collaborated with mining engineers in a common endeavour to obtain higher standards of performance and lower operating costs in the coal industry. Thus progressively its research and design facilities have been extended and now the new Crawley manufacturing plant at Llanelly, S. Wales ensures the most comprehensive service to users.

This complete technical service depends for its ultimate success upon design and construction backed up by accurate application and installation.

The Crawley service includes:—

Calculated Research into the application of mechanisation and automation to the mining industry with particular emphasis on more economic production.

Production Facilities enable the company to meet the rapidly increasing demand for mechanisation.

Installation Engineering advice and assistance based upon considerable plant experience.

Service and Maintenance facilities are available at all times to users of Crawley equipment and arrangements are made for examination and testing of this equipment at regular intervals.

The Company offers prompt service in the supply of important spares.

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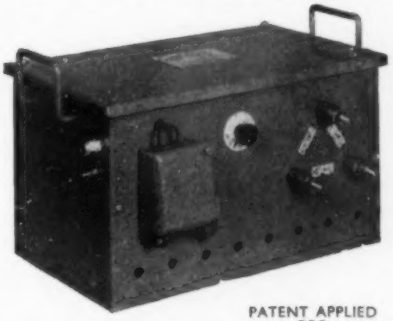

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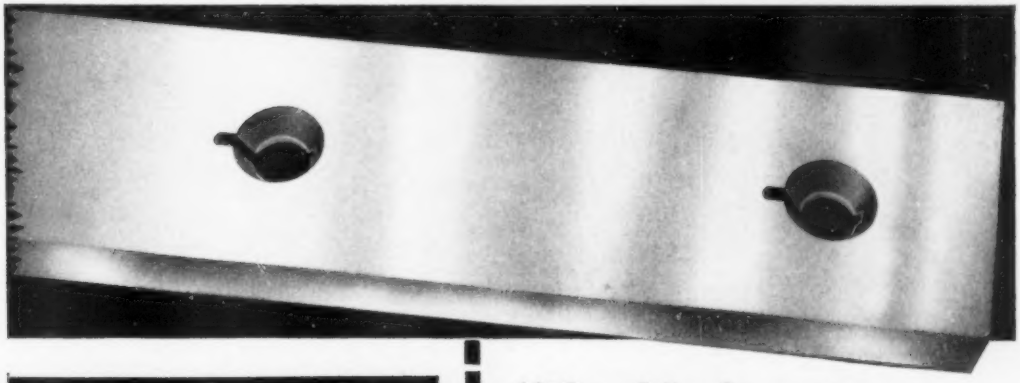

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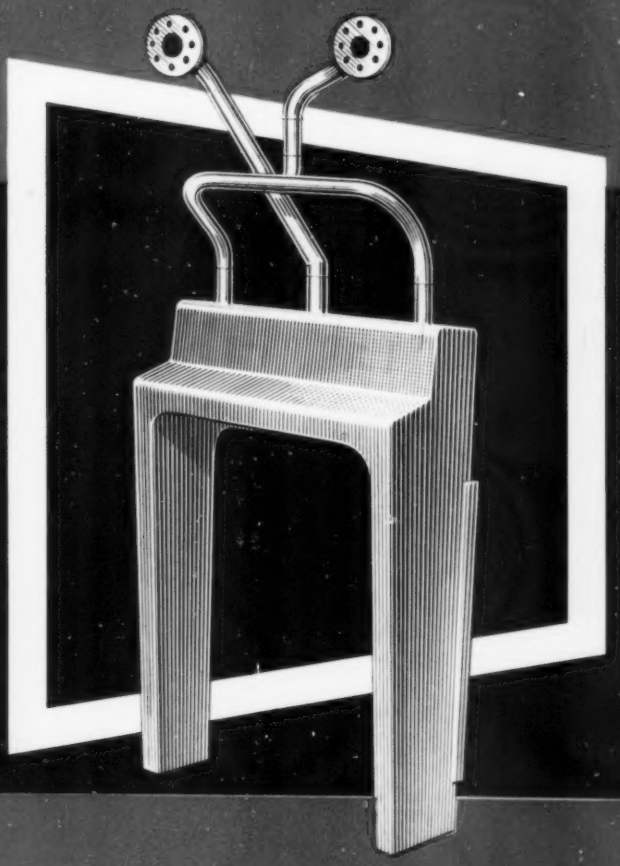

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VOL. 192
No. 4,943

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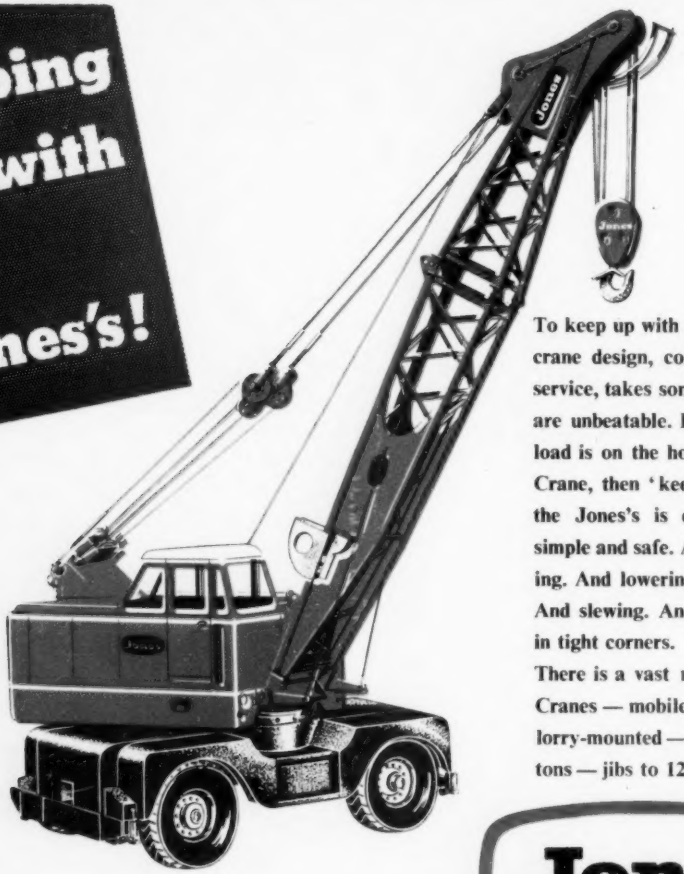

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